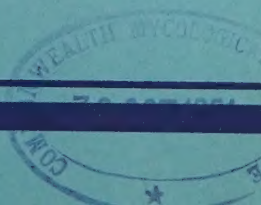
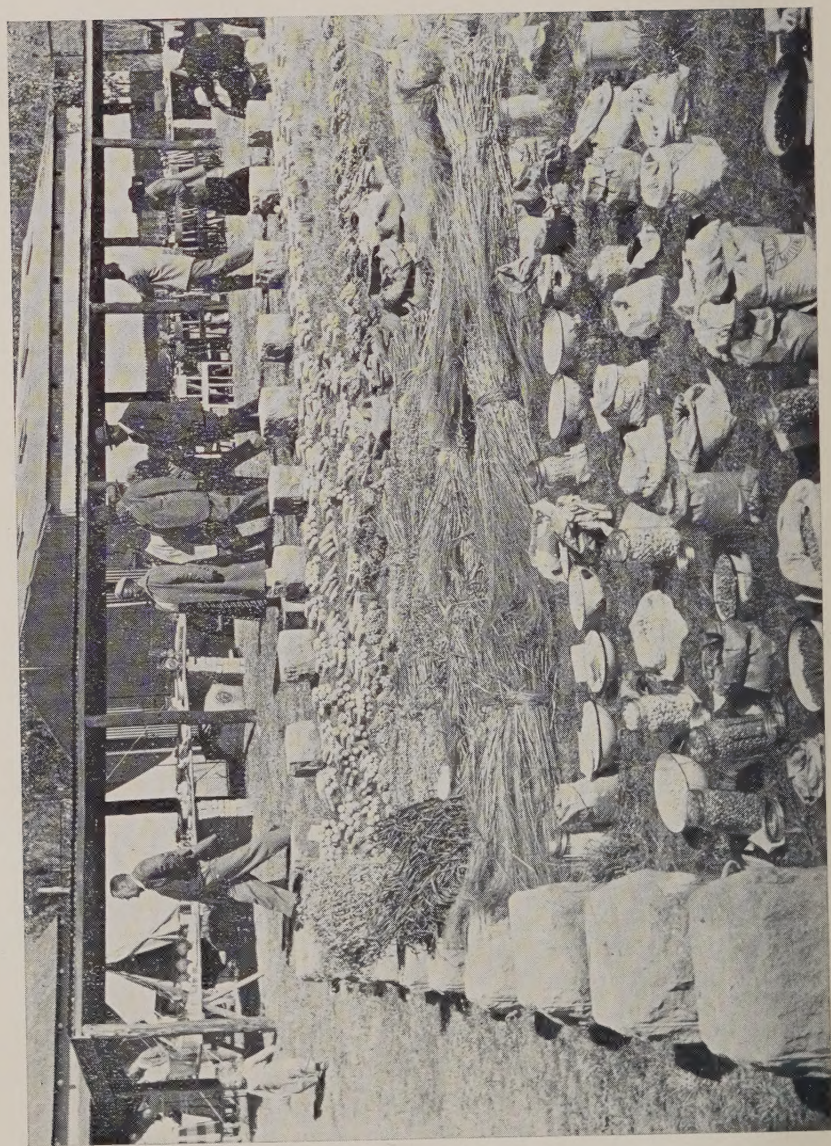

B A S U T O L A N D

DEPARTMENT
OF
AGRICULTURE

ANNUAL REPORT
1957





The Paramount Chieftainess and her advisers inspecting grain exhibits — Maseru Agricultural Show.

BASUTOLAND

DEPARTMENT
OF
AGRICULTURE

ANNUAL REPORT

1957

MASERU
BASUTOLAND

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Obituary.

Philip Alan Bowmaker, O.B.E., B.Sc., N.D.A., A.I.C.T.A., Director of Livestock and Agricultural Services, Basutoland.

News of the death of Mr. P. A. Bowmaker, O.B.E., which occurred on the 2nd of February, 1958, after a comparatively short illness, will be received with the deepest regret.

PART I

THE AGRICULTURAL INDUSTRY OF BASUTOLAND AND ACTIVITIES OF THE DEPARTMENT OF AGRICULTURE.

SECTION I

REVIEW

1. THE TERRITORY

Basutoland is an enclave within the Union of South Africa, some 11,700 square miles in extent. Temperatures range from occasional periods when maxima rise above 90°F. to over 20°F. of Frost in winter. Rainfall is variable, but averages 29 inches yearly, mostly occurring during the summer months. Growing seasons for the main crops are short and limited by the arrival of planting rains in the spring, September to October, and the advent of the first frosts in autumn, usually towards the end of April.

Agriculture is the sole industry of the Territory and although maize is produced widely, particularly in the lowlands and foothills, it is consumed internally and the money earning products are wool, mohair, wheat and sorghums and peas in that order.

Four fifths of the Territory are steeply mountainous and almost without roads, although bridle paths and tracks, negotiable only by mules and pack horses, abound. The 250,000 inhabitants of these parts rely almost entirely upon these small, sure footed animals for the transportation of their produce and requirements.

The remainder of the Territory consists of the lowland areas where soils are largely derived from sandstone, usually much less productive than the rich mountain soils from which latter, rainfall and human effort are the factors largely determining the final gain.

The great proportion of the population lives however, in the lowlands and foothills to the west of the Territory, where climatically and geographically, living conditions are not quite so difficult; but crop yields are poor on account of soils which are fundamentally lacking in plant nutrients having been subjected to many decades of exploitation. Monoculture, lack of return of animal and crop wastes to the soil and soil erosion form the background to the crop production picture in the lowlands.

The estimated total acreage cultivated is a little over 1,000,000 acres.

At the present rate of increase the population will reach 1,000,000 by 1963.

2. POLICY

In years past the Department has concentrated on the rehabilitation of the soil by the application of the most suitable methods, such as the construction of contour furrows, buffer strips, meadow strips, the building of dams in many areas purely as silt traps, and has always advocated the adoption of organised grazing methods in the mountain areas.

Throughout the years we have continued to import selected Angora goat and Merino sheep rams to improve the quality of our wool and mohair clip and at the same time have attempted to get the co-operation of flock owners in eliminating bastard type small stock, particularly rams.

For some years past the horse breeding section has continued to distribute to selected custodians a number of good type Arab stallions which will eventually improve the horses of the Territory and bring them back to the small stocky, hardy type of animal which is so essential for use in the rugged mountain areas. Previously the horse blood had been spoilt for this work by the misguided use of thoroughbred stallions on local mares. The thoroughbred is not a horse which can exist easily under the conditions imposed upon it by most Basuto owners.

The Departmental Field staff have in past years spent most of their time encouraging the producers to adopt improved methods of farming, but in many cases they have been forced to act as policemen in pursuance of these duties with the result that often the staff are not looked upon as the "farmers' friend"; an outlook which is so essential for the furtherance of development work. As will be seen later in this report, an attempt is being made to correct this attitude on the part of the people.

PRESENT POLICY.

The policy of the Department, broadly stated, is to improve land utilisation and methods of husbandry, and through these to raise the yields of agricultural products and thereby the standard of the farmers.

Soil conservation work and wool and mohair and equine improvement continue as in the past.

3. PROGRESS

(1) Basutoland National Council Agricultural Committee.

During the year the above Committee, comprised entirely of Africans, met on several occasions and submitted a report to the National Council.

The Committee was formed at the request of Councillors, to investigate "the cause of bad harvests in Basutoland".

After pointing an admonitory finger at almost everyone else the Committee ended up by making their report a self-condemnatory one

as far as the Chieftainship is concerned and it is worthy of note that the question of altering the present system of land tenure was given a fair amount of publicity by the Committee.

In view of the fact that the lowland soils have been almost continuously cropped for upwards of a hundred years under wheat, maize and sorghum, which amounts virtually to a monoculture, and because manuring or fertilizing is very rarely practiced, it is not surprising that the present state of infertility has caused some alarm. That the people themselves appointed such a Committee points to an increasing awareness of their own responsibilities in such fields.

(2) Cattle Post Beaconing.

During the year the cattle post areas, high plateaus and mountains at an altitude of over 8,000 feet which are uninhabited and are used as summer grazing grounds, were beacons and mapped. This was done as a first step to prevent further incursion by the population and to establish a system of grazing control which would allow for the recovery of the vegetation and its maintenance at optimum production. These areas are very important, both economically and physically. Economically they produce a large proportion of the wool and mohair, and physically they are the water shed, not only of Basutoland but of a great part of the Union of South Africa.

(3) Agricultural School Students.

The sixteen students who obtained their Diploma in Agriculture from the Agricultural School all accepted Government appointments as Agricultural Demonstrators and were posted to field extension work in the districts. There is no doubt that this regular supply of young men, trained in general agriculture, with the emphasis on local problems, will do much to increase the efficiency of the extension work.

(4) Trading Account.

A Trading Account has been opened by the Department to supply such things as fertilizers, insecticides, scotch carts, seeds and improved pigs and poultry. These items could not readily be obtained through normal trade channels and the facility of obtaining them through the Department is much appreciated by the farmer. Results during the first year of trading were very encouraging. Further mention is made of this in Part II, Section 1. (8).

(5) Taung Rehabilitation Scheme.

A development which may lead to the application of similar work throughout the lowland areas of the Territory has originated in the ward of the Chief of Taung. This area lies in the South-West of the border lowlands, comprises some 190 square miles, and has a rainfall of approximately 28 inches a year. Through the traditional methods of agriculture the ward has become semi-arid with eroded lands and denuded grazing areas. Soil conservation works were silted and broken and the position was so bad that the standard of the inhabitants was

reaching semi starvation. Under these conditions the normal extension methods of the Department had little impact: in fact it was virtually impossible to put into effect the advice given. Meetings were held with the local authority and they were gradually brought to realise that only by a complete change of traditional land usage could improvement be effected. These conditions were accepted by the Paramount Chief and by the Chiefs and people of the area.

It has not been found necessary to enact any new legislation in order to meet this problem and so far the rehabilitation has been organised through the existing machinery of Ward Chief, sub-Chief and Headman.

Co-operation from the people in the early stages of the scheme has been extremely good and this is almost entirely due to the whole-hearted support given to Departmental efforts by the Administration. In this area we have been fortunate in having an Administrative officer appointed full time to deal with any matters affecting his branch of the service and for liaison duties with the Chiefs and people of the area. Further details concerning this scheme are to be found at Section VI.

(6) Future Policy.

As mentioned under paragraph 2, the Departmental Field staff have of necessity become involved in policing duties which are not strictly their responsibility.

The feeling of the people towards the staff is reflected in their distrust of any attempt to introduce extension work and their unwillingness to accept the staff as the "farmers' friend".

In an attempt to overcome this unfortunate state of affairs, it was decided towards the end of the year that a Government policy for agriculture should be drawn up and circulated amongst all officers and people concerned in the running of the Territory. In acceptance this written policy would become the "bible" for future agricultural work.

(7) Other Activities.

Wool and Mohair.

Improvement in wool and mohair, through the importation and subsidised sale to flock owners of stud sheep and goat rams, and through the provision of shearing sheds and qualified wool and mohair classers, has continued.

Mechanised Group Farms (C.D. & W. Schemes 2205 and 2205A)

The failure of three of the groups to collect cultivation charges and of their Committees to organise the working of the group has caused further enquiry into the most suitable way of applying mechanised farming in the Territory. The general opinion is that the Basuto would prefer a hire service run as a commercial concern and investigation along these lines is being pursued.

4. STAFF

Disposition of staff as at 31st December, 1957, is given at Appendix II. In May, Mr. P. Millin, who had previously been on contract, was appointed Agricultural and Livestock Officer.

Mr. A. Bisschoff was appointed Senior Agricultural and Livestock Officer in July.

During September, Mr. P. W. A. Davies, Agricultural Officer, was transferred from Kenya.

Mr. A. L. Mapham, Agricultural Officer, was transferred to Swaziland during November; During December, Mr. J. J. Axentowicz, previously a Development Officer, was appointed Agricultural and Livestock Officer and Mr. C. M. H. Morojele was appointed Statistician.

At the time of submitting this report Mr. D. D. Campbell is acting Director of Livestock and Agricultural Services and Mr. A. G. Brightmore is acting Principal Agricultural Officer.

5. RAINFALL CONDITIONS

Rainfall figures for the Territory are given at Appendix I. In many areas conditions have been too wet for successful farming operations. In the lowlands ploughing and planting of summer crops was unduly delayed and winter wheat affected by rust and waterlogged soil. In the mountain areas wheat and peas have been adversely affected by heavy, frequent rains and cool overcast days.

The summer crops to be harvested in May-July, 1958, will be average in most areas.

It is of interest to note the considerably higher than average rainfall over the past two years. Afforestation and the grazing areas of the country have benefitted thereby, but field crop yields have in many instances been depressed.

6. VISITORS AND VISITS

During a visit to the Territory in January, His Excellency the High Commissioner was able to see some of the work of the Department at Taung. The vantage point used during the demonstration is now called High Commissioner Peak by the local people. Among many other visitors in chronological order were:

the Director of Agriculture, - Bechuanaland, Mr. I. S. Hutcheson, and the Director of Land Utilization, Swaziland, Colonel C. J. van Heerden, Professor O. S. H. Reinecke of Stellenbosch-Elsenberg College of Agriculture, Mr. G. M. Roddan, C.M.G., Deputy Agricultural Adviser to the Secretary of State. Mr. Hudson, Conservation Engineer of the Department of Agriculture, Southern Rhodesia, Mr. E. Isang, Agricultural Officer, Eastern Nigeria, Mr. D. Rhind, Secretary for Colonial Agricul-

tural Research, Colonial Officer and Mr. D. W. S. Hunt, O.B.E., of the Commonwealth Relations Office.

Members of the staff of the Department who made visits to neighbouring Territories were as follows:—

Mr. Venn, Soil Fertility Officer, to Kenya, Uganda, Southern and Northern Rhodesia.

Mr. Bowmaker, Director of Livestock and Agricultural Services, to various meetings of the Wheat and Maize Industry Control Boards in Pretoria and to the S.A.R.C.C.U.S. Conference in South West Africa, accompanied by Mr. Youthed, Soil Conservation Officer.

Mr. D. D. Campbell, Principal Agricultural Officer, to various Committee meetings in Pretoria.

Mr. J. G. S. Bennie, Wool and Mohair Officer, to meetings of the Wool and Mohair Advisory Boards.

Mr. D. H. Taylor, Administrative Officer, Pilot Project, to attend a Food and Nutrition Conference in Uganda and to visit the Department of Native Agriculture, Southern Rhodesia.

SECTION II

AGRICULTURAL EDUCATION AND PUBLIC RELATIONS

The term Agricultural Education is used in its widest sense to embrace the various activities of the Department which aim at making the general public and Departmental staff more agricultural and extension minded.

Such activities are as follows:—

(1) Agricultural School.

Because of the lack of training facilities in the Union for Basuto who wish to study for an Agricultural Diploma Course the Department started a small training establishment three years ago and now issues its own Diploma to students who complete the two year course.

Steady progress continues at the school and the first batch of students who joined Departmental Field Staff during this year have proved outstandingly good.

Modification of the training methods in the light of experience gained has been necessary and now in its third year the school runs smoothly and efficiently. A report by the officer in charge is given at page 14.

(2) Agricultural Journal and Publications.

The half-yearly—Spring and Autumn—publication of the “Basuto Farmer’s Journal” continued. This Departmental activity which provides an instructional and informative handbook, written expressly for the improvement of agriculture at local level, remains popular. The interest shown by the Basuto is evidenced by enquiries made regarding the articles printed, and this awakening interest is reflected in the extension work in the field. During the year a simple booklet entitled “Some Results of Agricultural Research in Basutoland” was published and some 2,000 copies were issued to schools, Chiefs and farmers.

(3) Public Relations.

It has been decided to extend the propaganda methods used. In the past the agricultural demonstrators and touring officers have, with the exception of the journal mentioned above, been the means of contact with the Chiefs and people. The success of the journal has led to the appreciation that, as the Basuto are becoming more literate, much more can be done in this way. The first of a series of booklets and pamphlets has been published and issued free to the people. The interest shown was most marked. Film strips, posters, school competitions and articles written by specialist officers for the vernacular press, are to follow.

(4) Agricultural Shows.

A Territorial show was organised and held in Maseru on the 23rd—24th May. Previously only small shows had been held at District level with but limited interest and value.

There are various small Farmers Associations in the Territory, some of them amalgamated under the Basutoland Agricultural Union. The Department fostered the development of this show under the auspices of the Basutoland Agricultural Union and the result was excellent. About 6,000 people visited the show, there were over 1,000 entries in the various classes, and the finances were sound, approximately £100 being carried forward.

It has been decided to make the show an annual feature, one of the two days of the show being Empire Day. There is no doubt it will do much to raise the standards of husbandry and home crafts.

(5) Co-operation with Schools.

In addition to the normal visits to primary schools by field demonstrators, the Educational Department is giving the added facility of allowing more senior agricultural officials to address congresses and meetings of the Basutoland African National Teacher’s Association (B.A.N.T.A.). Great interest is shown in the various lectures, and from the questions put to the lecturer it is only too apparent how keen this section of the community is to obtain further knowledge, both on technical matters and on policy.

It is considered that this field will soon show the benefits of this aspect of public relations work.

(6) Discussions with the Paramount Chief.

An African member of the staff has for the past few years acted as liaison officer between the Department and the Paramount Chief and her Advisers. The following subjects discussed by him and the Advisers give an indication of the usefulness of this appointment and the sort of subjects discussed.

(1) *Lack of Maintenance: Soil Conservation Works.*

The question of not maintaining the completed anti-soil erosion works was discussed with the Paramount Chief and Advisers on several occasions, and meetings were arranged with the Paramount Chief and the Director of Livestock and Agricultural Services to discuss re-organisation of this work. The matter was eventually taken to the Basutoland Council where certain recommendations were made for consideration by the Paramount Chief and the Resident Commissioner. Meanwhile the Administrative Assistant succeeded in getting some tools, i.e. spades, picks and wheelbarrows, from the Basuto National Treasury, which are being used by maintenance men under their supervisor in the Maseru District. These men are working as a team and they go to an area where much damage has occurred. This team comprises a nucleus around which the local people are encouraged to repair the soil conservation works in their areas. It is acknowledged that this is not an ideal system in that only a small portion can be tackled at a time, and other areas in which these men are usually posted are not being attended to. However, their present function in these areas was just that of inspectors who did very little or no work because of lack of proper supervision. This system of employing them as a team is, therefore, of a temporary nature pending the re-organisation that is contemplated. The maintenance men work directly under the Chieftainship and not under the Department.

(2) *Eradication of Noxious Weeds.*

The Paramount Chief was asked to issue an order to Chiefs and people to launch a campaign for the eradication of noxious weeds, especially along the Free State border. This campaign was planned to run simultaneously with the one launched in the Free State by the Union authorities. After the issuing of the order the Administrative Assistant visited the Principal and Ward Chiefs in all districts except those of Qacha's Nek and Mokhotlong to explain and to urge them and their people to clear their areas of noxious weeds. This is a very necessary measure if the good name of our wool and mohair is to be maintained. The response was very good in the Northern districts of Butha Buthe, Leribe and Berea, but in the other districts it was rather indifferent, and prosecution had to be resorted to. Most of the Chiefs complained that the courts were not very helpful in this matter because they are reluctant or they delay in the hearing of the cases taken to them. This complaint was reported to the Paramount Chief who referred it to the Registrar of the Basuto Courts with an injunction that necessary action be taken in the matter. On the whole some

improvement was noticeable in the areas in which the Administrative Assistant made an inspection on horseback with the officers of the districts concerned.

(3) *Ploughing of Thite (virgin) Lands.*

The Administrative Assistant had discussions with the Paramount Chief and Advisers on this matter which is upsetting the balance between arable and grazing lands of the Territory. Several meetings were arranged between the Paramount Chief and the Director of Livestock and Agricultural Services to consider this important matter and to agree on a future policy. It was agreed that the matter be referred to the Basutoland Council to hear its views and advice before a final decision is reached.

Regarding lands which are situated on steep slopes and which are to be taken out of cultivation the Administrative Assistant accompanied the Principal Agricultural Officer and Chief Patrick 'Mota, who represented the Paramount Chief, to Chief Kethisa's Ward in the Leribe District, where by mutual consent with the Chief and the Development Officer, certain lands were taken out of cultivation and a demarcation line was agreed above which no ploughing was to be done in the future.

(4) *Lectures at the Agricultural School.*

During the year the Administrative Assistant lectured in the senior class at the Agricultural School once a week on civics. These lectures were based on the laws, rules, orders and customary usage in Basutoland. This is designed to equip the students with the knowledge of the laws, the system of land tenure and the correct method of approach to the Chieftainship in agricultural matters, all of which will be of much value to them when they leave school to work among their people in the districts. Books which are mainly used in these lectures are parts of Proclamations 61 and 62 of 1938 and the Laws of Lerotholi.

(5) *Pilot Project and Mechanised Groups.*

The Administrative Assistant accompanied members of the Standing Committee when they visited the Pilot Project to enquire into the cause of defection of some members from the mechanised groups. He also accompanied the deputation which was sent by the combined mechanised groups to the Paramount Chief to make certain representations and recommendations towards the solving of some problems which had arisen in their groups.

In conclusion I should say that some Chiefs are slowly becoming conscious of their responsibilities and are taking the trouble of trekking through their areas to see things for themselves and to deal with them on the spot.

NTSEKE J. MOLAPO.
Administrative Assistant

PART II

SECTION I

CROP PRODUCTION AND FOOD SUPPLIES

The seasons in Basutoland are broadly speaking as follows:—

September—November	Spring	Rains commence.
November—April	Summer	Growing Season.
April—June	Autumn	Harvesting.
June—September	Winter	Cold dry season.

(1) Exports and Imports of Foodstuffs.

Crop yields generally were fair. Below are given exports of Wheat, Peas, and Beans and Sorghums for which export permits were issued, together with export figures of these commodities for the past four years for comparison. At Appendix III monthly imports of Maize, with average imports for the last nine years, are given for comparison. £22,270 was paid to the Union Government as a refund of Union consumers' subsidy in respect of 90,960 bags of maize imported into Basutoland.

EXPORT OF FOODSTUFFS (In bags of 200lbs. nett)

	1953	1954	1955	1956	1957
Wheat	38,629	54,478	27,575	82,114	101,077
Peas and Beans ...	25,967	54,160	39,677	62,943	47,300
Sorghums and Malt	57,951	17,371	10,168	5,645	10,003

(2) Maize and Sorghums.

Because maize to a great extent and sorghums to a lesser extent form the basis of a Mosuto's diet there is a considerable acreage of these crops planted in the lowlands, foothills and even in the warmer mountain valleys.

The natural desire of the people for these crops leads them to attempt cultivation even at high altitudes, but such attempts usually end in failure due to the short growing season. Early autumn frosts, year after year, nullify the optimistic efforts of the cultivators.

The export of sorghums, although double that of 1956, is still well below average. The crop was affected by the planting of immature seed, the previous year's crop having suffered from early frosts, and also by conditions which were too wet for successful sorghum growing. To some extent too, by pressure on the land which permits of less available land for cash crop cultivation, sorghums being recognised as a partial cash crop.

The maize crop was a fair one and imports of this staple food from the Union were down by over 40,000 bags. It is thought that the increasing use of D.D.T. for control of stalkborer may have had an influence on the yield. Climatic conditions for the growing of maize were such that the optimum yield which can be expected under the present methods of agriculture were obtained. It is disturbing to realise that from a Territorial export of 37,000 bags of maize in 1948 there has been an ever increasing trend of import figures, and that despite the optimum climatic conditions approximately 91,000 bags of maize were necessarily imported during 1957. It is hoped to raise the fertility of the lowland soils—maize growing areas—by impressing on the people the necessity to manure their lands. The campaign to plant trees in order to provide an alternative fuel to kraal manure has been intensified. As a temporary measure the Department is fostering the sale of phosphatic fertilizers.

(3) Wheat.

The lowland wheat crop was almost a total failure due to heavy spring rainfall, waterlogged lands and the incidence of rust. On the other hand the mountain crop, which is grown in summer and harvested about February, was a good one. The much larger export figure for wheat, the largest on record, is due to an increase in the acreage under wheat with a corresponding drop in the acreage under peas. Both wheat and peas are a cash crop, very little being consumed locally, and the recent fall in the Union price for peas has had a marked effect on the balance between wheat and peas in the mountain area.

(4) Peas and Beans.

Peas are mainly grown in the mountains as a summer crop and until recently had commanded a high price in the Union. They were sold on the Indian market in Natal and until 1955 were worth up to £50 a ton. This market has declined and today's prices are less than half of those enjoyed two years ago. As a consequence fewer peas are being grown. An attempt to stimulate the demand is being made by advising growers to plant the varieties most in demand by the trade instead of, as at present, growing mixed varieties.

Beans do not play an important part as a cash crop but are often planted as a "snap" catch-crop after lowland wheat has been harvested in January or February. The beans are harvested green and as a protein rich food form a useful addition to the local diet which is greatly lacking in this constituent. Those not harvested green are usually stored and eaten later or sold locally as a cash crop.

(5) Other Crops.

Oats and Barley: are grown to a small extent for use as fodder, being cut, bundled and stacked for winter feed, mainly for horses. Just prior to the harvesting of lowland maize during March and April many people can be seen cutting and stacking.

Blue Grass: Normally a variety of *Poa*, which they later use for

stock feed or sell to local traders who dispose of it to European stock owners in the Territory. It is encouraging to note that each year the number of people who feed some or all of their stock in winter is increasing.

Potatoes: the growing of potatoes is increasing significantly, some even have been exported to bordering Orange Free State towns. Where soils are sufficiently fertile there is an excellent cash return from this crop, and in order to foster the growing of potatoes, seed was made available through the trading account of the Department. A cash crop which lends itself to peasant agriculture, and which at the same time will fit ecologically into the conditions and altitudes of the Territory is being urgently sought. Swazi tobacco has been successfully grown on a small trial plot and steps are being taken to try Turkish tobacco over a wider area during the coming year. If this is successful it may do much to alter the economy of local agriculture.

(6) Vegetable Gardens.

One of the most progressive aspects of agricultural extension work is the establishment of vegetable gardens. The first record of gardens to cover the whole Territory directly under the auspices of the field staff, is given in the 1938 report, when the number of gardens had increased from 837 in 1936 to 2,927. The present Territorial figure is 28,404.

The varieties of vegetables grown have also increased considerably. A few years ago the range consisted of pumpkins, cabbages and carrots. Today tomatoes, which for some reason the Basuto were loth to adopt, are widely grown and crops such as spinach, onions, leeks, cauliflower, potatoes, artichokes and various culinary herbs are very popular. The ultimate aim of the Department is to have a developed garden for each rural household.

SECTION II

OTHER ACTIVITIES

(1) Co-operative Societies.

A full report on the activities of the Co-operative Societies can be read in the Registrar of Co-operative Societies' Annual Report for 1957. It may well be of interest, however, to record that there is a very close link between the work of the Department and that of the Co-operatives in many aspects of our work.

This, of late years has been particularly so in the case of Wool and Mohair Co-operative Societies, where often the facilities of the Department in connection with the shearing and classing of wool are made available to Societies.

In Mechanised Group Farms, Departmental Staff, often aided by an

officer from the Registrar of Co-operative Societies' staff have worked hand in hand to foster development of the groups, unfortunately in some cases without success.

The Co-operative Societies however, where they have proved successful from a useful media through which Departmental staff can easily spread propaganda and through which certain commodities which farmers require such as fertilizers and seeds can be supplied to them at very reasonable rates.

During the latter part of the year, negotiations were being entered into with a large South African Co-operative Union to organise the sale of cattle through Co-operative Societies in this Territory. The system discussed would involve spot cash for cattle sold over a weigh-bridge.

(2) Maseru Experiment Station.

With the easing in the rate of capital development work it was possible to devote more attention to the main functions of the institution and good progress was made in all sections.

Research: A large programme of field experiments was continued on the main station and on six small district sub-stations. The scheme for co-operative fertilizer trials on farmers' holdings was repeated. Pending the establishment and staffing of the Experiment Stations in Swaziland, further exploratory fertility trials were laid down in that Territory.

New ground was broken with the start of greenhouse pot investigations and a number of Basutoland and Swaziland soils were examined for deficiencies. After initial difficulties a suitable routine was developed.

Further progress was made in the development of the four investigational and training units on the station.

In Part II Section III of this report are detailed the results of 1956/57 investigations in Basutoland. Below is a summary of findings:

More information was collected on the dominating phosphate deficiency in lowland and foothill soils. Phosphate fertilizers bring about 100% and greater yield increases in all crops on most sites in these regions. The conclusion is drawn that the general use of phosphate fertilizers will make the Territory more than self sufficient in food production. Co-operative statistically analysed experiments on Basuto farms demonstrated that the use of fertilizers is highly economic and that first year residual effects are large. No benefit is obtained from applications of potash, irrespective of soil type. The Mountain Black Clays are extremely fertile and do not respond to manuring.

Important results were obtained on the use of nitrogenous fertilizers for maize. Response to N is related to plant population. An application of 60lb N per acre to a stand of 15,000 plants per acre, with basal phosphate, increased grain yields by 1,750 lbs per acre. In another trial a considerable response was obtained from an application of limestone ammonium nitrate (40lb. N per acre) ploughed with the stover in winter. Where no stover was incorporated the nitrogenous fertilizer was less effective. No responses to N were recorded

in sorghum while for winter wheat the effect of N is found to depend on spring rainfall conditions.

Experiments on liming were continued. The liming of acid red ferruginous soils has proved highly beneficial and on the lateritic foothill red loams on basalt, (pH 5.4.), maize responses to liming of 1,300 lb. per acre have been recorded. On the lightly buffered grey-brown sandy loams of the lowlands liming is dangerous and severe minor element deficiencies are readily induced.

Field experiments with minor elements have given indications of a widespread molybdenum deficiency in the lowlands and foothills. Applications of molybdenum trioxide at the rate of 4 ozs. per acre produced significant responses in field beans and maize (which had received adequate basal fertilizer) on sites representative of the three main types of soil in these regions. Considerable significance is attached to the results, which may have implications for large areas of Southern Africa. The relationship between these results and those from lime trials requires investigation. In greenhouse pot experiments a deficiency of sulphur in a lowland grey-brown (solonchic) sandy loam has been demonstrated. In one field trial an application of gypsum increased maize yields by 440lbs. per acre.

Variety trials and selection work were continued on various crops and further information on performances in relation to ecological regions accumulated.

Various trials were carried out on the relative values and cost of production for lucern grown under overhead spray irrigation and flood irrigation.

Under flood irrigation the capital outlay to equip 25 acres was approximately £2,300 whilst for the same area under spray irrigation the outlay is £2,440.

The recurrent cost per acre for spray irrigation is £39 and for flood irrigation approximately £18.

Assuming a yield of 5 tons per acre at £10 per ton under both systems the profit to be made from spray irrigation was £11 per acre whereas from flood irrigation it was £32 per acre. In view of these figures the lucerne grown at the Experiment Farm under spray irrigation was ploughed out and the area used for pasture trials. The lucerne under flood irrigation continues.

(3) Agricultural School.

Despite many difficulties, mainly connected with the number of teaching staff available, the insufficiency of transport and inexperience with teaching methods which ought to be adopted, the school has continued to make good headway.

A second full time teacher was appointed and a temporary secondment terminated. The resident staff now consists of an Agricultural Education Officer (Principal) and two full time teachers, assisted by three station officers and five officers from Maseru, all of whom handle the subjects which concern their department or divisions.

A new scheme whereby selected entrants spend three months working in the field under Departmental staff before commencing their

studies at the school was put into operation. The new students are able to gain an impression of the problems facing the Department and its *modus operandi*. At the same time further selection of entrants is possible. The scheme worked well and will be continued.

The first graduation ceremony took place in May, 1957, when fourteen men were presented with their diplomas by His Honour the Resident Commissioner. All the graduates subsequently joined the Department as Assistant Demonstrators. Reports indicate that they are performing good services and it is apparent that the School will in time make a considerable impact upon agriculture in Basutoland.

Progress was made in the establishment of four agricultural units, which, while being essentially investigational, form admirable grounds for training in practical agriculture. Each unit consists of 6 acres of arable and a 25 acres share in 100 acres of "communal" veld grazing. (a) Fresh milk production, (b) poultry and egg production, (c) butter production, and the sale of pigs and (d) horse breeding and sheep farming, form the basis of the four systems. While students are allocated to particular units they work on the unit "headquarters" in rotation, thereby gaining practical experience in a wide range of husbandries and operations. The standard of farming on the units is higher than that met with generally in Basutoland but it is not so high as to be unattainable by progressive farmers.

During the year two sets of stores and cattle kraals and a poultry house were erected, together with various temporary structures.

Application has been made for further funds to provide essential facilities for the School, including buildings, equipment and livestock for the units.

(4) The Farm.

The farm consists of 600 acres of land surrounding the training school and upon which much of the experimental work, research and training of students is carried out. In many cases it is difficult to say where research work ceases and demonstrations to students begin or where production, as in the case of pigs and poultry can be separated from the practical function these units supply in training students.

The following notes give some idea of activities on the farm: -

Development work on the Farm.

Little construction work took place. A building consisting of a wash room, kitchen and dining-room for labourers was completed together with one rondaval.

Pigs and Poultry.

The production and distribution to Basuto farmers throughout the Territory of pigs, poultry and eggs continued. The demand again exceeded the supply. During the year 35 weaner pigs, 2,078 3-month old and adult birds and 387 dozen eggs were sold.

Tree Nursery.

404 boxed evergreen species seedlings and 20,000 young deciduous trees were issued for planting from the farm tree nursery.

Trading Account.

During the report year, four Departmental votes for the purchase and resale of agricultural commodities were terminated and purchases of items for resale consolidated in an Advances Account operated from the Experiment Station. The scheme will undoubtedly prove of great value to the Department and to farmers. Amongst others, 74,000 packets of vegetable seed and 156 tons of fertilizer were sold during the last four months of 1957.

There is a great need in Basutoland, and also in many other African Territories, for cheap, robust and durable farm carts. The lack of a suitable mass produced type is a serious problem. Cart sales form a substantial part of the account transactions and the problem is receiving attention.

SECTION III

LIVESTOCK INDUSTRY

(1) Economic Aspect.

The year 1957 has been an excellent one. Good general rains fell throughout the summer, autumn and spring and the grazing has been in excellent condition. *Thus*, in spite of a rather severe winter, the livestock have kept condition and are, at present, in fine fettle.

(2) Livestock Auctions and Sales.

After the failure of the 1956 sales no further attempt has been made to re-establish auction sales in Basutoland, meanwhile the traders through whom stock is now sold, are permitted to import one tolly (yearling cattle) for every beast exported.

The first essential of any such system is that it should bring about a regular turnover in cattle and that old oxen and cows should not be allowed to die from old age but should be sold in exchange for young oxen and heifers. It is still too early to determine whether the scheme is achieving the result desired, but the position is being closely watched and further steps will be taken to bring about successful trading in livestock should the present measures prove inadequate.

Successful sales were held at Qacha's Nek where 861 cattle and sheep were sold during the year.

(3) Sheep and Wool.

(1) Wool Clip.

Due to another good season the wool clip was clean and wellgrown. Representatives of both buyers and brokers complimented the

Basutoland Government and the traders on the get up of the wool clip, while complaints from the Union Government wool inspectors at the coast were at a minimum. This is a very satisfactory state of affairs.

In May the classing symbols of the fleece lines were altered to conform with those in force in the Union of South Africa. The change was effected without inconvenience to those concerned.

The average price at the coast for the January wool sales was 41.32 pence per lb. This rose steadily to 44.97 pence in April. In May, however, the close of the 1956/57 wool season, the average price fell to 42.82 pence. In September, the first month of the new season, the price was down to 35.28 pence, and this recession continued until the end of the year when the average for December, was 30.6 pence.

The overall weighted average price realised for Basutoland wool on the sales at the coast during 1957 was 40.94 pence per lb. compared with 33.72 pence in 1956. This is an increase of 21.41%.

During the year 7,058,431 lbs of wool were exported legally as against 7,292,626 lbs the previous year, a decrease of 3.21%. These export figures do not take into account the unknown quantity of wool smuggled into the Union to evade export duty. This practice is thought to be on the increase.

On the basis of 40.94 pence per lb. the wool known to have been exported was worth £1,204,050 at the coast. This is an increase of £179,436 on the 1956 figure.

(2) Sheep Improvement.

562 Merino rams were introduced from the Union, 257 more than the previous year. Most of these have found a ready sale to Basuto stock owners at subsidised rates.

Reports from the districts indicate that the elimination of undesirable rams in the Territory is proceeding satisfactorily.

(4) Goats and Mohair

(1) Mohair Clip.

As with wool, the mohair clip was clean and well-grown. It is, however, generally agreed that exporters as a whole should take more trouble with the classing of mohair.

The season opened well with an average price for March of 91.10 pence per lb. Unfortunately this high level was not maintained, and prices fell steadily until September averaged only 72.18 pence. A partial and very temporary recovery in October took the prices up to 76.91 pence, only to be followed by a severe fall down to 60.39 pence in November. This latter figure does not, however, truly reflect the market trend, as owing to the depressed state of the market at the time the greater part of the top fleece lines exported were not sold on the sales. Thus the average price quoted for November is to all intents and purposes in respect of the lower lines only.

The overall weighted average price of Basutoland mohair on the

sales at the coast during 1957 was 79.12 pence per lb as compared with 76.66 pence the previous year. This is an increase of 3.21 %.

Export duty was paid on 1,056,066 lbs of mohair in 1957 as against 1,068,082 lbs the previous year, a decrease of 1.13 %. As with wool, these figures do not take into account the mohair smuggled over the border into the Union.

On the basis of the above average price and the export figures the 1957 mohair clip was worth £348,149 at the coast, £6,986 more than last year.

(2) Goat Improvement.

223 Angora rams were imported from the Union of South Africa for sale to Basuto farmers at subsidised rates. This is 17 more than in the previous year.

The undesirable ram position is under control but there is a long way to go to complete elimination.

(5) Wool and Mohair Marketing.

(1) *Classing Instructions.*

Courses for Government and traders' classers and the general public were held in all districts. Unfortunately very few farmers made use of these facilities.

(2) *Shearing Sheds.*

During the first half of the year five new sheds were erected in the mountains, bringing the total number to 100. Three existing sheds were moved to more suitable sites and others were provided with paddocks and catching pens.

No further work was undertaken because in June the mule transport team was loaned to Public Works Department for transport work in connection with the Ox Bow Scheme and was returned to this Department in December.

It is thought that more use could be made of these sheds by the farmers as it would be to their advantage and for the betterment of our clips. Attempts are being made to educate flock owners in this direction.

J. G. S. BENNIE *Wool and Mohair Officer*

6. Hides and Skins.

No progress can be reported. 105,930 hides and 28,789 skins were exported during the year.

7. Tattooing and Registration.

The tattooing and registration of livestock is carried out by the Tank Area Supervisors twice yearly in February—March and September. Under closer supervision faults have been eradicated and the results have shown a marked improvement.

From enquiry, it does appear that this tattooing is serving a useful

purpose and several cases have been reported where these marks have led to the rapid recovery of stolen animals.

(8) Equine Improvement.

This has been an unfortunate year for the Agnes Mary Young Memorial Stud, which was reported on fully in the 1953 Annual Report. Six mares aborted during the past winter, one gave birth to stillborn twins and a yearling colt died from urethral occlusion. In spite of these setbacks, however, the stud has made progress and now numbers some twenty-eight mares, twenty-eight fillies and twenty-two colts,—thirteen of which are standing at stud throughout Basutoland.

A further grant will enable the stud to acquire a number of Basuto type mares which should increase the value of the stud enormously. Provision has also been made for the purchase of another Arabian stallion.

A stallion has also been placed under the demonstrator in the Taung Reclamation Scheme. Owners have been invited to produce mares for inspection and if they measure up to the required standard they are given a certificate which records the description of the mare and includes a photograph and entitles the owner to have his mare served by the stallion at a reduced fee. It also makes provision for recording of services and progeny and as such acts as a form of registration. These certificates are apparently highly prized.

(9) Cattle Improvement.

Three further Brown Swiss bulls were purchased during the year — two for the Taung Reclamation Area and one to replace an old bull in Leribe. The demand for these bulls is still great and many enquiries are being received from farmers who wish to purchase Brown Swiss cows and heifers. The high prices of such cows and heifers, £35/5/- each, are still a deterrent, but there are signs that the stock owners are beginning to take practical steps to improve their stock by importing good quality animals with the help of the Veterinary section. While the Government recommends the Brown Swiss as the breed most likely to do well under Basutoland conditions and to improve the milk producing qualities of the Basuto cattle, it does not prohibit the importation of other breeds, consequently owners are free to bring in bulls of other breeds and many Afrikanders and Short-horns have been imported.

P.H. BROWN

Principal Veterinary Officer

SECTION IV

VETERINARY

1. ANIMAL HEALTH

There was little animal disease this year. Basutoland suffered no epizootics and losses from disease were relatively small.

2. SMEAR EXAMINATIONS

During the year some 106 smears were examined with the following results:—

Anthrax	...	...	...	...	1
Gallsickness	...	...	...	...	3
Quarter Evil	...	...	...	...	4
Biliary Larve	...	...	...	...	24
Negative	...	...	...	...	66
Unsuitable	...	...	...	...	8
					106

3. SCHEDULED DISEASES

(1) Anthrax.

There was one outbreak of Anthrax in Maseru. This was, as usual, effectively controlled by block inoculation of in-contact animals. During the year 48,700 doses of Anthrax vaccine were used.

(2) Quarter Evil.

Some 21 outbreaks were reported during the year, the distribution being as follows:—

Qacha's Nek	...	...	...	...	1
Leribe	...	...	...	...	11
Mafeteng	...	...	...	...	7
Maseru	...	...	...	...	1
Quthing	...	...	...	...	1

In all 13,950 doses of Quarter Evil vaccine were issued.

(3) Equine Mange.

It is still widespread throughout Basutoland. During the year some 1,300 cases were treated.

(4) Mange in other Livestock.

One case of goat mange was encountered in the Quthing district. The affected animal was destroyed by the owner and there was no extension of the outbreak.

(5) Lumpy Skin Disease.

Although this disease has not reached the epizootic proportion of the summer of 1956, cases have been reported from as far South as Quthing. No reports have as yet been received from the mountain areas, and the disease appears to be confined to the lowlands. No deaths have been recorded as yet.

(6) Rabies.

No cases have occurred. Some nine dogs and cats have been inoculated prior to proceeding to rabies infected or suspected areas.

(7) Foot and Mouth.

While the severe outbreaks of Foot and Mouth which occurred in the Union, Bechuanaland and Rhodesia did not at any time threaten Basutoland, it was considered advisable to tighten up on the control of the import of cattle into Basutoland. This Territory is in a fortunate position in that it enjoys the full protection afforded to it by the Union Veterinary Division. Owing to the absence on leave of the Principal Veterinary Officer, no assistance to the Union by way of staff could be rendered during the recent outbreaks.

(8) Other Scheduled Diseases.

Rinderpest, East Coast Fever and Scab do not at present occur in Basutoland, although the recent outbreaks of sheep scab in the Cape Province are disquieting.

4. NON-SCHEDULED DISEASES

(1) Anaplasmosis and Piroplasmosis.

Several cases of gallsickness and redwater have been reported, which, in view of the weather conditions, was to be expected. Limited amounts of gallsickness vaccine were used, in all some 242 doses having been issued from the Clinic.

(2) Strangles.

A large number of cases were seen during the year, the majority being severe with abscess formation. No losses were recorded, as all cases responded to treatment.

(3) Biliary.

In keeping with the weather conditions and very heavy tick infestation, the incidence of biliary, especially in dogs, has been very severe. As in past years several dogs have failed to respond to treatment. These cases seem to be peracute and normally death supervenes within one—two days.

(4) Tetanus.

No cases have been seen.

(5) Verminosis.

The campaign against internal parasites in small stock has made steady progress and the Tank Area Supervisors, who are responsible for this work, are getting down to the job. Veterinary Assistants are responsible for the supervision of these Tank Area Supervisors. From personal observation and reports it does appear that the stock owner is aware of the value of regular dosing and co-operates by producing his stock at the dosing centres. A study of the dosing returns indicates that dosing varies from 90% efficiency in some areas to only 15—20% in others, so there is still a long way to go.

(6) Poisoning.

Seneciosis took its usual toll of horses in the mountain area, but owing to the good grazing, losses were not significant.

(7) Horsesickness.

Very few cases were reported. 1,700 Doses of horsesickness vaccine were issued.

(8) Bluetongue.

Losses from this disease were reported, but were not significant. 8,000 Doses of vaccine were used.

(9) Enterotoxaemia.

Was not encountered during the year. 2,000 Doses of vaccine were issued.

(10) Distemper.

Few cases were seen. Some 17 pups were inoculated against this disease.

(11) Feline Enteritis.

Few cases were encountered.

(12) Infectious Infertility.

Several cases of contagious abortion were recorded. Other forms of infectious infertility probably occur but have not been recognised as yet. 41 Doses of Strain-19 were issued.

(13) Poultry Diseases.

(I) COCCIDIOSIS a disease of young poultry reared under intensive conditions was found to be rife on the Experiment Farm, Maseru. Losses were high. It is not normally a disease which troubles owners who rear chicks under a broody hen and in small numbers.

(II) FOWL TYPHOID has been reported throughout Basutoland and all poultry issued from the farm have been vaccinated against it. Some 9,400 doses of vaccine have been used.

(III) FOWL POX is common but losses are not significant. 3,800 doses of vaccine have been issued.

(IV) OTHER DISEASES have been encountered, amongst which Lymphoid, Leneosis and Blackhead have been most common.

5. OTHER ACTIVITIES

The Maseru Clinic has dealt with the usual cases of minor wounds, biliary, distemper, dystobias, retained placentas and major and minor operations. In all some 500 cases were treated, fees collected amounting to £700/-/-.

The District Veterinary Assistants run clinics in their areas, and although this clinical work must take second place to disease control, they collected the sum of £614/-/- in respect of drugs and vaccines sold.

P.H. BROWN.

Principal Veterinary Officer

SECTION V

SOIL CONSERVATION

1. SUMMARY

Earlier in the year a survey of progress made on the ground was carried out. This survey also investigated those areas which to date had not had any mechanical works constructed in them. It became evident that the foothill areas of the country which had only been buffer-stripped would require the construction of certain mechanical works. It was decided that these areas would have to be tackled as soon as possible.

This has necessarily altered the whole picture as far as the time limit previously set for completing the initial stabilisation works is concerned. It is now estimated that this work will have to continue until about 1965 in order to cover all areas requiring diversion furrows, gully banks and dams.

The number of gangs operating in the field have been reduced and regrouped into three main groups which now receive better supervision from the Senior Conservation Foreman and Assistant Soil Conservation Officers.

2. PROGRESS

(1) Buffer Stripping.

This operation is virtually at an end in all districts and only 1,559 acres of land were buffer stripped this year. This is about 10% of the

area covered last year. The field staff have now been put on to meadow stripping.

(2) Terraces.

This phase of the operation has been badly held up by the adverse weather and mechanical breakdown of plant. However, 28,665 acres were terraced during the year which is about 9,000 acres more than last year.

Constant repairs to damaged works have stepped up the cost per acre quite considerably. Last year's cost of less than £1 per acre has increased to £1.75 per acre in some districts.

(3) Diversion Furrows.

Very little activity can be reported in this operation as it is policy to delay large scale construction of diversion furrows until the meadow strips have been laid out and become consolidated. Only about 800 yards of diversion furrows were laid out.

(4) Dam Construction.

Twenty-nine earth dams with a total capacity of over 50,000,000 gallons were constructed by all groups. This is very good progress indeed seeing that heavy rains interfered so much with operations.

A large multiple arch weir was built in the Leribe district and is working very well indeed. The total notch width is sixty feet with a depth of four feet. The cost is £1,000. This is the first structure of this type put up in the Territory and several more have already been planned in other areas.

(5) Tree Planting.

This vital work continues to improve year by year and during 1957 over 400,000 trees were planted out in plantations, dongas, and along the Caledon River bank.

All nurseries are producing very well indeed and most requirements in the Territory were met.

(6) Meadow Stripping.

A meadow strip is an area of grass which provides a disposal point for water and in so doing does not become eroded. This work has made very good progress in all districts and over 700 miles of meadow strips have been demarcated. The problem now remains to see that these demarcated strips are observed by the landowners.

Once these strips have been stabilised they will be used as disposal areas for diversion furrows which will be constructed in the lands.

(7) Donga Beacons.

This operation has received very special attention in Mohale's Hoek where a modification of the old system has been applied to the Taung Reclamation Area. In this scheme over 13,000 acres have been beacons off as unsuitable for cultivation and efforts are being made to stop the existing cultivation in these areas and transfer it to approved

areas. Despite attempts to do this many Basuto continue to ignore the beacons and plough in areas which are closed.

(8) Production Table for 1957.

	Prior to 1957	During 1957	Totals to December 1957
Area Terraced (acres)	449,904	28,665	478,569
Length of Terraces (miles)	25,568	396	25,964
Buffer strips (acres)	686,278	1,559	687,837
Diversion Furrows (miles)	3,950	$\frac{1}{2}$	3,951
Dams Constructed	512	29	541
Concrete Weirs	1	1	2
Trees Planted	1,087,676	400,000	1,487,676
Dongas Beaconed (miles)	5,368	—	5,368
Meadow Strips (miles)	—	718	718
Reclamation Beaconing (acres)	—	13,296	13,296

S.H. YOUTHEED
Soil Conservation Officer

SECTION VI

FORESTRY OFFICER'S REPORT

Tree Planting.

Tree planting in Basutoland is encouraged for one of three main reasons.

(a) To supply fuel for fires in order that the present use of dung can be discontinued and the dung so saved, returned to the land as manure.

(b) To act as an anti-erosion measure in water courses and along river banks.

(c) For building purposes.

The aesthetic value of trees is also appreciated by the Basuto but until they can control the wanderings of their small stock there is little hope that unprotected trees will flourish.

The year under review was characterised by unusually good rains during the deciduous tree planting season. Full advantage was taken of this and in spite of financial stringencies, all rooted cuttings in the various Districts and field nurseries were planted out in the plantations with good results, as the survey undertaken by the Agricultural Statistician will show.

New areas were taken in for planting purposes. Here, perhaps,

is where lack of funds was most apparent, as these areas have not been fenced in for this reason.

Field nurseries were started and operated in some places but in others nothing could be done beyond selecting suitable areas as no fencing was available.

Schools and Church premises were supplied with rooted cuttings. Distributions were made to schools primarily with the object of making the children, who had to plant the cuttings, tree-conscious.

Pitso's of adults were held and the advantages of tree planting pointed out, with the result that where formerly Chiefs and people were hostile to the taking in of areas for tree plantations, urgent demands for plantations in their areas now come in voluntarily. Here again financial difficulties occur. Another limiting factor is that at their present stage of development the nurseries could not supply the demand in full. As these nurseries are increased and cuttings become increasingly available it is hoped that this difficulty will be overcome.

The Basutoland Central Finance Committee has been approached with a view to making increased funds available and the matter is under consideration. It is hoped that in April, 1958, the beginning of the financial year, new and better arrangements will be made.

Plans are now afoot to plant basket willows (osier) for the projected basket-making industry for the Blind.

The whole length of the Caledon River bank on the Basutoland-side was planted with poplars (Alba) and willows, but more work will be required here. This work is considered to be so important that a Soil Conservation Foreman has now been temporarily seconded to it.

During the year:

400,000 Poplars and Pines were planted out in the field.

It is estimated that sufficient deciduous cuttings and coniferous seedlings have been established in the nurseries to at least double production for the forthcoming season.

SECTION VII

TAUNG REHABILITATION SCHEME

Previous mention has been made of this interesting land rehabilitation scheme under Progress.

Some of the details are now given as it is hoped that by seeing this scheme as a blue print and recording progress in detail future work of this nature, of which there will be much, will not suffer from

mistakes that have been made in the early planning stages of this scheme.

A preliminary survey revealed that of a total area of 102,333 acres, 56,825 were cultivated, and 45,508 comprised village areas, rocky and eroded areas and what could be described as grazing areas. Stock consisted of 5,963 cattle, 1,058 horses, 1,045 donkeys and 19,618 small stock. There were 3,657 families occupying the area. It was a problem of socio-economic rehabilitation.

Co-operation was at first good and during the two years the work has been under progress the level of crop production and grazing, due to a large extent to higher than average rainfall, has been remarkable. With this recovery the immediate necessity for the drastic measures has, in the minds of the people, fallen away, and a tendency has developed to ignore the advice of the Department. At the present time some 400 cases are awaiting trial of people who have disobeyed the order of the Chiefs and have ploughed outside the prescribed areas, have grazed stock in prohibited areas or have in one way or another defied the local Native Authority on the reclamation measures which had been agreed to and adopted.

Briefly, these measures were to assess land usage, to group arable lands in suitable areas and to reallocate them to the people; to reduce the arable acreage and to bring in systems of grazing control. As a temporary measure all small stock and much of the large stock were to be moved from the area and villiages were to be moved to more suitable sites.

Along with this have gone more concentrated efforts at improving husbandry. Improved stallions and bulls have been supplied. Soil conservation works have been repaired, trees planted, dams built, and in every way the Department could help this help has been given.

The plan which was drawn up for the reclamation of the area shows that under good management it will carry all, and even slightly more, than the people and the stock which were found in it, allowing some 6 acres of arable land per family.

If the present position of defiance by certain elements to the necessary measures for improvement cannot be resolved administratively under the existing machinery, it would appear that work of this nature will need legislation which will ensure its success. Its importance is obvious, for the whole of the lowland area, much of the foothill and certain of the mountain areas need to be tackled in the same way.

PART III

RESEARCH AND INVESTIGATION

SECTION I

PILOT PROJECT

Description of work in progress given in previous annual reports on this scheme apply also to the year under review, save as augmented or amended in the present report.

1. RECLAMATION

(1) Soil Conservation.

Works constructed from 1st April, 1953 to 31st December, 1957.
Soil conservation bunds

(mechanically constructed)	=	496,557 yds	4,965 acres
Buffer (grass) strips			
(marked out using land owners' own oxen)	=	1,087,455 yds	4,468 acres
Diversion furrows above cultivated lands (by hand)	=	23,540 yds	941 acres

A small amount of work has been done by schools in the construction of stone silt barriers in gullies and on rock outcrops. Some 'agave' has also been planted in gullies. This work undertaken by schools is primarily educative.

(2) Dams.

Twenty-two dams have now been constructed in the Pilot Project area. Ten of them have been made with mechanical equipment. The other twelve are smaller and have been built using ox-drawn scoops, to provide water for stock or gardens, mainly in the upper half of the Tebetebeng Valley, where there are new village sites.

The twelve smaller dams include five new ones constructed during the year under review. These dams, although not of large capacity, are successful and only one of the twelve has silted up.

No new dams have been built by mechanical means. Of the ten previously built, five have now completely silted up. It is proposed that these be planted with grass and reeds. The silting is one index of the effectiveness of the soil conservation measures already applied. It indicates there are still many conservation problems to solve in the lower half of the catchment. Proper maintenance for the complete protective works is a matter of urgency but it is unlikely that the position can be satisfactorily stabilised by any measures short of fully planned land use. No new programme of dam building, other than for stock and garden watering, is envisaged until the necessary safeguards against silting can be introduced.

(3) Tree Planting.

The village grant scheme for planting rooted grey poplar cuttings in gullies and dongas was continued. In the period February to April, 2,220 cuttings were planted. A grant of $\frac{1}{4}$ d. per tree was paid for labour provided by the chief or headman from his villagers. Few trees were planted during this autumn period as the rate of the grant had been reduced, the previous rate of 1d. per tree being considered too high. The number of autumn planted poplars which have survived is very small and it is thought better to concentrate entirely on spring planting.

When spring planting began in July the grant was fixed at the rate of $\frac{1}{2}$ d. per tree, and 39,978 rooted cuttings were planted in five headmen's areas as follows:—

Phefo Tsikoane	...	...	...	12,096
Napo Mapeshoane	...	...	...	11,464
Molepo Mohele	...	...	...	6,574
Mika Rantikane	...	...	...	6,034
Ntsabane Kholopane	...	...	...	3,810
				39,978

The amount paid out to the labour supplied by the headman was £78/5/9. By the end of the 1957/58 summer it will be possible to assess the value of this work, and consider whether it should be continued and extended outside the Tebetebeng Valley. The problems are the low rates of survival of the trees estimated at not more than twenty-five per cent, the protection of the trees once they are planted and the lack of real interest and control on the part of the headmen concerned.

More data on the rate of survival is being collected. The Paramount Chief has agreed to the scheme being continued and has asked the Ward Chief to ensure that existing plantations in gullies and dongas are closed to grazing stock and protected, as no fencing is used in this scheme. The question of whether the trees belong to the Chieftainship or to the people has not yet been clearly answered. It is agreed only that the trees be planted for the use of the people. The lack of a clear statement about ownership may account to some extent for the lack of real interest shown by certain Headmen. Nevertheless it is felt that the Paramount Chief's directive is useful.

During the year children from the nine schools in the valley planted the following numbers of trees:—497 pines, 1,928 poplars, 79 gleditzias, 30 blue gums and 56 willows. These were planted in areas given by the local headman for school plantations; these plantations are not fenced. The aim in this work is that the school teachers assisted by the Agricultural Demonstrators show the children the correct methods of planting different types of trees.

(4) Planting of Grass and Reeds.

A small quantity of kikuyu grass was planted on diversion furrows in two areas. Some of the schools also planted grass.

(5) Grazing Control..

Systems of controlled and rotational grazing have been worked out for portions of the Headmen's areas in the valley. The initial step is to persuade headmen of the value of closing an area to grazing during the summer months and later to introduce a rotation for two or more of these areas; all areas being opened during the winter.

Two new areas, including one controlled by four headmen were closed during the year on advice given, but not in all cases was the control effective. Rotation systems were started in four new areas including one controlled by three headmen; not all of these are yet working efficiently.

In areas where the headmen were previously persuaded to introduce control and rotation, some systems are being properly enforced but the problem of the disinterested headmen and the inadequate supervision of stock herds has not been solved. The Development Officer who was in charge of this grazing control work finds it very necessary to make regular visits to all but the most efficient headmen to ensure that they maintain the systems introduced.

Another problem is that more stock, especially sheep and goats, should be sent to the mountain cattle posts areas during the summer. This is made difficult in Teyateyaneng district by the small area of cattle post country available.

The need to teach headmen and people about the value of grazing control is appreciated. Consideration is being given to arranging such instruction.

(6) Improved Land Use.

The removal of badly sited villages on steep slopes in the foothills of the upper valley is proceeding slowly. Several new planned villages are arising on suitable sites but many people still ignore the Ward Chief's instructions to move. A number of unsuitable lands used in the vicinity of the old villages have been taken out of cultivation and new areas for the allocation of lands have been recommended to the Headmen concerned.

2. DEMONSTRATION

(1) Agricultural Extension Work.

The work continues and an increasing number of the more progressive farmers are coming to the Pilot Project staff for advice and for help in obtaining good seed, fertilizer and insecticides. However the progressive farmer is still in the minority.

A small hall has now been completed at Pilot Project headquarters where cinema shows, meetings and lectures are held and where photographs illustrating the work of the Pilot Project are displayed.

(2) Field Experiments.

Small trials in connection with response to trace elements in the foothill soils are being carried out by the Soil Fertility Officer in

charge of the Maseru Experiment Station. Pilot Project staff are responsible for one of these trials in the upper part of the valley. Yields for peas and maize are being tested.

(3) Carts,

The demand for farm carts which has been fostered by the scheme, continues, in spite of the increased price of the popular Zebra Cart, which is imported from the Central African Federation. A total of 150 carts has been sold since the scheme started. This number includes several different types of carts. The actual number sold in the vicinity of the Pilot Project is 31. It is noted with regret that most farmers who buy carts do not usually maintain them properly—many, when inspected, are found to lack oil or grease and need minor repairs. Agricultural Department staff are asked to give regular advice in order to educate farmers to appreciate the need for cart maintenance.

A new trading account to be operated from the Maseru Experiment Station has now been authorised to facilitate the sale of carts on credit. It will also make quantities of fertilizer, seed and insecticide available for cash sales throughout Basutoland. This account replaced the Pilot Project trading account as from 1st September, 1957. The Pilot Project will now only act as one of the selling agents, together with other District Agricultural Offices. Consideration is being given to finding a source of supply for a cart which will be cheaper than the Zebra cart, but equally serviceable. An all metal cart manufactured locally in the Union of South Africa is not proving satisfactory.

(4) Livestock Improvement.

Five Brown Swiss bulls are available in the valley and each is controlled and managed by a local headman. The aim is to improve the quality of the local stock by producing good cross bred progeny which will be better than the stock at present owned by the people. Of the five bulls, three are being run successfully in closed herds, from which scrub bulls are excluded. This system results in a greater number of progeny compared with the normal method of having cows brought to the bull camp for a few days for service and then returned. The other two bulls are at stud in bull camps but they tend to be over zealously guarded by their custodians.

The total numbers of progeny recorded for the bulls is as follows:—

Custodian	No. of cows served		No. of progeny	
	1956	1957	1956	1957
Lenkoane Mapeshoane (2 bulls closed herd)	40	61	38	43*
Tlhabeli Tsikoane	9	No record	5	No record
Philimon Mota (closed herd)	16	No record	10	No record
Mabolokoe Mapeshoane	22	16	16	13

* Some progeny thought not to have been recorded.

3. INVESTIGATION

(1) Co-operative Mechanised farming.

Four co-operative mechanised farming groups were started in the Pilot Project valley in 1953. This section deals with the state of these groups at the 1956/57 harvest and at the ploughing season for the following year. One of the groups (the Malimong Society) has proved disappointing and little use was made of its tractor in 1956/57. At a general meeting attended by only nine members it was decided to liquidate the society. The remaining active members joined the near by Rampepe Mechanised farming Society.

The last named society is the most successful of the three remaining. It has thirty-one members who have paid a ten shilling share subscription. When the societies were first started no subscriptions were paid; their introduction has certainly led to this society being a more corporate organisation. A few members of the Thaba Chitja Mechanised Farming Society have also paid subscriptions but its activities are hampered by an ineffective committee and its progress is hindered by a dispute between two headmen who control the area where the tractor works. The third group, the Mesapela Mechanised Farming Society, is virtually operated by one man: its committee no longer meets and its tractor is hired mainly by people living some miles from the society's original headquarters. These people do not own land in the block which was originally cultivated by the society's tractor.

The societies continue to pay their secretaries and drivers and provide fuel and oil from their own funds. But the original idea of each tractor working some 250 acres of arable land in one compact block, has had to be abandoned, because many of those with lands in the original blocks do not wish to use the tractor if they must pay in advance for its services; pre-payment of charges has been found essential. The more progressive farmers who wish to make use of the tractor do not necessarily own adjacent land. Thus for the societies to return to working compact economic groups, would almost certainly entail reallocation of lands. Some of the progressive farmers have petitioned the Paramount Chief requesting that this be done. They have not yet received a direct reply but the Paramount Chief has asked the Ward Chief to try and re-establish the original blocks of land for tractor cultivation.

The work done this year by the tractors has been in scattered lands, consequently operating costs were high. The societies virtually operated a hire system, but members who had paid a subscription to the society were given differential rates. Because lands were so scattered, it is not possible to give overall yield figures for the year 1956/57 for tractor cultivation compared with non-tractor work. However, it can be assumed, from previous results, that tractor cultivated lands gave better yields, if at the same time proper husbandry methods were also applied. The majority of farmers who used the tractors did so only for ploughing. They do not yet appreciate the value of other tractor operations nor are they prepared to pay for them. There is no evidence that tractor ploughing alone will increase yield except in so

far as lands can be prepared for planting at the proper time in spring, there being no need to wait until draught animals are fit or available. Planting for which only two draught animals are required is usually accomplished by the farmer without difficulty, once the tractor has ploughed the land. Cultivation is done in the same way or by hand.

There is little doubt that tractor services are needed in Basutoland; in fact private operators are already doing useful work in some districts. The developments and problems revealed in the operations of the Pilot Project Tractor Groups will help to indicate the lines which future mechanisation in peasant farming can be encouraged.

No tractor operating costs are available for publication in this report, because of staff changes at the Pilot Project. The charges which societies were advised to levy for various operations in the spring of 1957 are based on previous statistics. It is most probable that these charges were sub-economic, because of the distances tractors were travelling to plough small areas of land.

The following table gives an indication of the progress of the societies:—

Name of Society	Area of lands ploughed 1956/57	Area of lands ploughed 1957/58	Society's monetary assets at Bank and in cash
Rampepes	104.94	109 acres	£207 at 26th November 1957
Thaba Chitja	48.04	59 acres	£109 at 27th November 1957
Mesapela	43.75	105.58	£153 at 10th October 1957

The societies continue to undertake a certain amount of transport work. This is encouraged when there is no work for the tractor in the lands. To be economical the tractors must be worked a much greater number of hours per annum.

(2) Other Trials.

(a) Irrigation—no further work has been undertaken.

(b) Fish Ponds—There are plenty of black bass in the ponds but it has not yet been possible to carry out a successful trial netting. The fish are difficult to net and the ponds so constructed that they cannot be completely drained. A further problem is that the dam above the ponds which should provide a steady supply of clean water is now silted up. The whole scheme is being reviewed in the light of the above difficulties.

4. COMMUNITY DEVELOPMENT AND EXTENSION

The planting of trees and grass and simple conservation work done by the schools has continued. The aim here is largely educative rather than to produce great material results. No new springs have been protected this year. Many villages have expressed their keenness but fail to contribute their share of the work.

Some springs need repair and consideration is being given to a

method of encouraging the villagers to maintain them. The principle that villagers must contribute in some form to the work of repair is being followed. Village planning has continued on a small scale where badly placed villages have been removed and re-sited.

A very successful schools' competition was held during the year. A cup was presented to the school with the best garden and which had done the best work in tree planting and soil conservation work. The work was judged over several months of the year.

A plan was drawn up in conjunction with the World Health Organisation nutrition team to encourage greater food production and better diets within the traditional ways of life in two adjacent headmen's areas. A social survey was carried out in the areas in July and the Basuto National Treasury offered a small sum of money to be used primarily to encourage the villagers to buy fertilizer on short term credit. The people however, have shown little interest in the benefits of this offer of assistance. They are suspicious of the scheme and it has been decided that the plan cannot be implemented until the confidence of the people in these two areas can be gained and until they themselves ask that this assistance be given.

Two African extension officers have been appointed to the Pilot Project scheme this year. They are being trained by working for a full agricultural season in the Pilot Project area. After training it is the intention that they go out to work in other districts of the Territory to start certain of the development and benefit projects which have been proved successful within the Pilot Project area.

A dispensary, consisting of two rondavals, is being built at the top of the valley. It will be staffed by an African nurse supervised by the local medical officer. This is the first step towards establishing a health centre. At present the medical officer makes weekly visits to the area and runs a dispensary in a building lent by a local headman. The problem of keeping open the road to this point at the top of the valley is a very real one. Heavy early summer rains have washed away sections of the road and a temporary dispensary is being operated once a week at a more accessible village lower down the valley. No money is available from the scheme for the maintenance of this road: the community's contribution to this project is to do this through a grant made by the Basuto National Treasury from local rate money. The present grant is inadequate. Unless the medical officer can get through to visit the dispensary regularly on a fixed day, the attendance of patients is uncertain. Such a difficulty would also hamper the proper running of the dispensary, even with a nurse stationed there, as she must necessarily refer a number of the more serious cases to a medical officer.

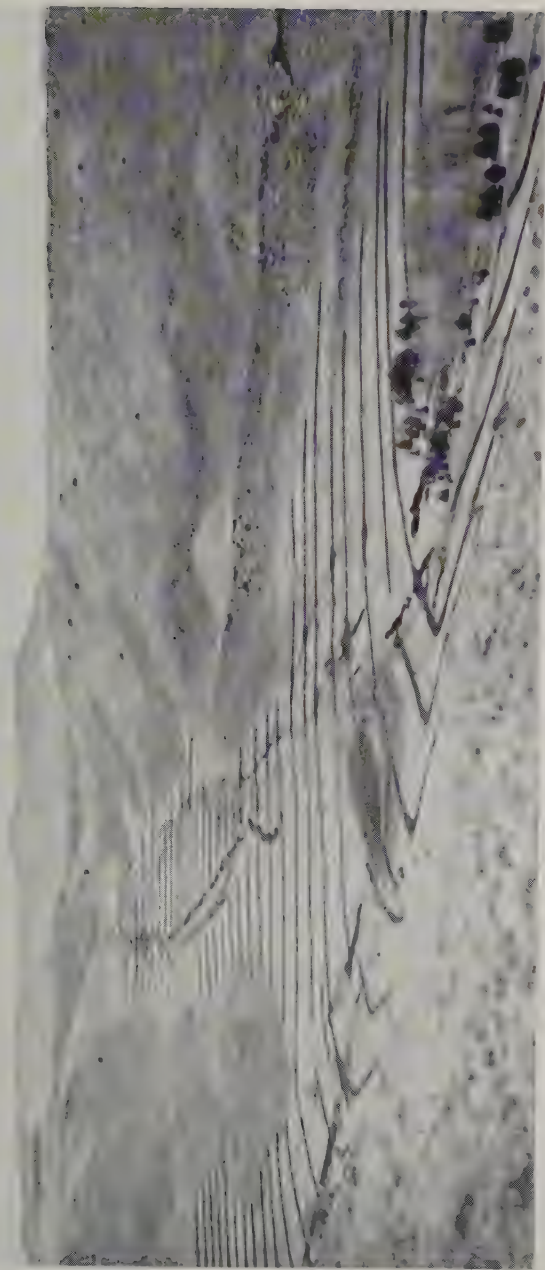
The Tebetebeng Farmers Co-operative Society which has played a small but potentially useful part in the life of the local community is going through a difficult period. It has suffered a loss of nearly £40 due to defalcations by the previous secretary. This has caused members to lose confidence in their society and is a heavy loss for a society with such little capital. It is hoped that the newly appointed secretary



Threshing Wheat in the Mountain Area.



Handicrafts Exhibits—Maseru Agricultural Show.



Soil Conservation Measures, Quthing District



Level of ocean water. The light patches are wheat lands.

together with the committee, will be able to improve the work of the society.

The big problem in all attempts to carry out community development schemes in the Pilot Project area is to persuade the people of the need to contribute voluntary labour. The small amount of work so far successfully accomplished has only been possible because of the efforts of one or two villagers who have realised the need to give voluntary service. The fact that able bodied men and persons with the ability to organise are not to be found is undoubtedly due in part to the migrant labour system.

5. PUBLICITY

Since the start of the scheme more than one thousand Basuto from other parts of Basutoland have visited it; the majority being parties from schools who came on their own initiative, in transport provided by the Agricultural Department. Photographs, news sheets and articles published in the press or journals continue to arouse interest about the scheme. The fact that the headquarters of the Pilot Project is not easily accessible, especially in wet weather, undoubtedly limits the number of visitors. Many Basuto have heard about the Pilot Project and a number write to ask for advice, but there are many more people who have no very clear idea of what is being attempted because they have not yet been able to visit the scheme and see for themselves. Equally so, it may be said that more Government officers, both European and African, should come and see the achievements and the failures, so that the fullest value may be had from discussions about the scheme.

6. STAFF

In September there was a change in the Administrative Officer-in-charge of the scheme, Mr. A.J.A. Douglas, M.B.E., who was largely responsible for building up the Pilot Project from its inception by hard work, perseverance and sound judgement, has gone on secondment to the Colonial Office. There was also a change in Agricultural and Livestock Officers in November, as Mr. A.L. Mapham, who had so ably assisted the Officer-in-Charge, accepted a transfer to Swaziland. It may take several months for the new officers to gain the confidence of the people, which is essential, before any new development work can be undertaken. The African Staff continue to give loyal support; the majority have served for several years at Pilot Project and know the people and the area very thoroughly. The personal contacts and knowledge which this staff has will be of great value to the two new officers.

7. OPERATION OF THE SCHEME

At the present stage it is becoming evident that the scheme must aim at educating the people to ask for improved agricultural and community development rather than hope to achieve great material success

in such development. The economic value of the scheme to individuals or the community is difficult to assess. It is probable that a few farmers have benefited in hard cash but it is evident that there has been no great improvement in the standard of living among the majority of the people in the area, since the scheme began. This is to be expected as the existing pattern of tribal life is very slow to change.

The close relationship of the scheme with the Chieftainship and other Government Departments is being maintained through two Committees. An Interdepartmental Committee meets quarterly and reviews the activities in the Pilot Project area in relation to Territorial policy. The Paramount Chief is represented on this Committee. A new local Committee has also been set up with the object of integrating the whole scheme more closely with ward and district administration; special emphasis being given to co-operation at local Government level.

8. CONCLUSION

The scheme is successful in that it is providing a testing ground for the practical application of better farming methods and projects to improve living conditions. It enables new ideas to be introduced to the Basuto and allows for intensive examination of the problems connected with normal improvement work (e.g. soil conservation). To persuade the majority of the people to realise the value of these improvements and to accept new ideas is still an uphill task. No decision has yet been reached about the future of the scheme from 1960 onwards. The matter is being considered by the Interdepartmental Committee.

D. H. TAYLOR
District Officer in Charge

SECTION II

MECHANISED GROUP FARMING

Reference should be made to the Annual Reports of 1954-1956 for the objects and conduct of this scheme.

Early in the 1956 season it was made clear to all Mechanised Group Farms that in future they would have to finance themselves entirely from their own funds, with only advisory assistance from the Scheme.

In order to ensure that their societies suffered no financial set-backs they were strongly advised to collect, from each member, his full cultivation and fertilizer charges before working his land. Assistance was given in some cases to collect this payment in "kind" where money was not forthcoming, but in spite of this timely warning the majority of groups persisted in working "unpaid", with devastating results to their bank accounts. Still stronger supervision of payments was given

Mechanized group farming

Name of Group	Acres Worked 1956/57	Acres Worked 1957/58	Cash in Bank at Oct. 1957	Crops Planted 1957	Average Yield per acre	Remarks
Manganeng	121	Nil	£ 217 15 5	Nil	(In 200 lb. bags) Mze 4.28 Bns. 1.00 K.C. 5.15	This group was badly broken up and because of non-payment of charges crops were planted late. No members payed for 1957/58 season at all.
Lovely Rock	121	Nil	£ 83 0 0	Nil	Mze 5.01	It was obvious throughout this year that the members of Lovely Rock had no interest in carrying on with mechanisation and the society was closed down in November, 1957.
Corn Exchange	162	Nil	£447 7 4	Nil	Mze 4.91 Bns 1.75	Due to non-payment of charges this Society has had to close down.
Peka (Manka)	133	109	£383 1 8	Maize and Beans	Mze 7.60 Bns 3.38	A fairly active committee runs this group but it is still too small an area to be an economic project. They seem to have grasped the idea of hiring the tractor out in off periods.
Tsikoane	177	145	£396 0 9	Maize	Mz. 10.54 K.C. 8.62	Because of the rich soil worked by this group it should stand every chance of succeeding. But this can only be if the members can be encouraged to take more interest in group affairs.
Maqeles	185	111	£208 9 7	Maize and Beans	Mze 7.22 K.C. 6.82 Bns 2.08	Leadership is lacking in this group. Although the members are keen to make a success of their group they are continually making mistakes in the administration of their affairs.
Makoanyane's	109	55	£177 6 5	Maize	Mze 5.44	The group has suffered many setbacks by prominent members refusing to pay their dues, but the remainder are making valiant efforts to save their group from total failure.

during this year and no work at all was done on lands not paid for, with the result that three of the seven groups have come to a complete standstill, and have had to close down. (Manganeng, Lovely Rock and Corn Exchange).

Unless the four remaining groups realise that they must collect at least the ploughing charges in June-July of every year, and that ploughing must commence at once, they too will never reap sufficiently good crops to make mechanisation pay.

The present position of the groups is given in tabular form at page 37. The remarks made by Mr. Taylor in his report on Co-operative Mechanised Farming at Pilot Project, concerning the factors which mitigate against the success of this work, apply equally to these seven groups outside his area.

It would appear that without land resettlement, and consequently a change in land tenure, it will be impossible to have continuous progressive land holders, a prerequisite to the success of Mechanised Group Farming.

A. H. GIBSON
*Agricultural and Livestock Officer
in Charge, Mechanised Group
Farming.*

SECTION III

1. SOIL AND CROP RESEARCH

1 General.

The research work is financed partly under Colonial Development and Welfare Scheme (Scheme R.758) and partly from Territorial funds. The programme of investigation into soil and crop problems was continued in Basutoland. Under the provisions of Scheme R.758 activities were expanded to include a small exploratory programme in Swaziland. This was possible following (a) the completion of most of the capital development on the Maseru Experiment Station and School of Agriculture, and (b) the reduction of the number of District Experiment Plots from ten to six. Results obtained in Swaziland will be dealt with in the report of the Department of Land Utilization of the Territory.

The dependence of Basutoland on agriculture has frequently been stressed as has its present precarious internal food supply position. While a major proportion of the factors responsible for the very low production from the land are political and sociological it is the erosion and improvement of the soils of the main arable belts which are the most serious technical obstacles to increased production (and to a reduction in food imports).

It is the opinion of the research worker that reform in land tenure and changes in various traditional agricultural practices, prerequisites to agricultural prosperity in Basutoland, can achieve little except social disruption in the absence of knowledge of suitable soil management systems.

Operations.

In Basutoland the investigational work is carried out on a central station in Maseru and on six District Experiment Plots of which there are four in the lowlands and one each in the foothills and mountains. Operations are centralised, the plot being run by the Experiment Station Staff. A further series of small trials is carried out on farms by field demonstrators.

Climatic Conditions.

Rainfall during the year, and more particularly over the 1956/57 cropping season (Total B) well exceeded the averages at all stations. In December and January a number of intense falls were recorded, which did much damage. Destructive hail storms were experienced on parts of the Maseru Experiment Station (twice, on December 19th and March 15th), and at Berea, Matsieng and Machache. Temperatures in mid season were sub-normal over lengthy periods. This, with waterlogged soils, made for slow plant growth.

For detailed rainfall see Table I. (p. 40)

The Experiments.

It was disappointing that in this, the first season in which some of the more interesting questions which had arisen from the initial exploratory research were investigated, there should be so many failures of trials due to climatic conditions. More losses occurred in 1956/57 than in any other year of the Scheme.

Hail not only destroyed several experiments but the damage necessitates the results from many others being regarded with some caution. The results from trials on nitrogen manuring in particular are possibly extraordinary.

In Basutoland 57 experiments covering 2,440 plots were planted on the stations and 27 small trials (288 plots) on farmers' holdings. Of these, 10 station and 9 farm trials were lost as a result of hail and floods and one station trial from theft. 4 others gave very poor yields.

All experiments except the farm trials were carefully planted by hand and precisely managed. The latter were machine planted. Techniques varied with trials and series. Details are given in abbreviated form for each project.

The N.P.K. Series.

The series with nitrogen, phosphate and potash on maize, sorghum and wheat was reduced from 29 to 17 experiments, all of which were laid out on the sub-stations.

TREATMENTS: Factorial combinations of three rates of each of

TABLE 1

Rainfall at Maseru Experiment Station and District Experiment Plots, Basutoland and three Centres in Swaziland
(Inches)

BASUTOLAND

Station	1956						1957												Total		Total	Mean
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	A	B	1956	Ann.
LOWLANDS																						
Leribe	3.93	4.42	4.87	1.12	2.36	3.08	—	—	0.95	4.09	4.25	10.59	6.64	3.84	5.01	2.44	0.4	1.11	35.39	37.81	39.32	32.25
Berea	2.9	6.09	5.04	1.18	1.01	0.2	0.26	—	0.69	3.96	1.89	9.46	4.89	2.84	2.82	0.86	0.47	0.91	26.15	28.79	29.05	26.65
Maseru	2.9	7.71	4.72	1.97	1.56	0.19	0.04	—	0.5	3.31	0.36	7.78	6.18	4.55	2.53	1.61	0.22	1.12	29.14	27.82	32.04	25.05
Matsieng	1.64	7.64	6.2	1.89	1.45	0.26	0.1	—	0.68	1.05	2.34	5.19	3.39	4.54	1.83	1.86	0.17	0.8	26.8	20.88	28.44	—
Mateteng	2.23	2.14	5.00	7.45	0.68	—	0.14	—	0.04	1.67	3.56	6.67	3.91	3.73	2.5	3.15	0.69	0.83	28.35	26.23	30.58	28.59
FOOTHILLS																						
Machache	1.59	6.07	6.25	2.95	1.00	0.30	—	—	0.77	2.45	3.87	8.32	5.41	2.47	3.13	2.08	0.85	0.73	—	28.5	33.57	—
MOUNTAINS																						
Mokhotlong	3.1	2.26	3.06	0.64	0.82	—	0.06	0.18	0.52	2.77	3.73	5.81	4.47	2.26	2.75	1.85	0.46	—	—	24.8	22.95	—
SWAZILAND																						
Bremsdorp	0.49	0.59	0.06	3.09	3.98	3.24	4.05	—	—	—	—	—	2.11	4.02	3.95	6.33	0.05	1.37	—	—	—	—
Stegi	0.41	1.51	0.33	4.06	2.48	4.84	8.39	—	—	—	—	—	2.91	4.51	3.03	5.22	0.12	0.93	—	—	—	—
Goedegun	0.36	0.55	0.02	1.17	3.62	2.59	5.10	—	—	—	—	—	4.35	4.31	2.63	4.95	0.25	0.94	—	—	—	—
Basutoland																						
Period effective rainfall Lowland wheat (Total A)																						
Basutoland and Swaziland																						
Period effective rainfall Foothill and Mountain Wheat, all maize, sorghum etc. (Total B)																						

TABLE 2 (M.E. Series)
Maize grain in 200 lb. bags per acre

Station	Mean Yield	Coef. of Var. %	Mean Yield: Plots without			Linear Responses			Curvatures			Linear Interactions										
			N	P	K	N	P	K	S.E.±	N	P	K	S.E.±	N'P'	N'K'	P'K'	S.E.±					
LOWLANDS																						
Leribe	...	...	5.43	17.15	3.66	1.42	5.66	**	**	3.25	+6.84	-0.31	0.44	+0.80	-3.55	+0.47	0.76	**	+2.74	-0.42	-0.67	0.54
Berea	...	...	6.47	20.68	5.09	4.06	6.65	**	**	+2.85	+3.55	+0.04	0.63	+0.30	-3.8	+1.24	1.09	*	+1.70	+0.11	+1.18	0.77
Matsieng	...	...	4.18	11.12	4.51	1.15	4.10	**	**	-0.75	+4.92	+0.30	0.22	-0.29	-3.4	+0.4	0.38	*	+0.18	+0.09	+0.3	0.27
Mafeteng	...	...	9.22	18.25	8.78	7.4	9.36	+	+	+0.85	+2.53	-0.18	0.79	-0.10	-3.31	+0.47	1.37	+	+2.66	+1.37	-0.54	0.97
FOOTHILLS																						
Machache	...	...	4.04	22.39	3.97	1.49	4.18	**	**	+0.01	+4.60	-0.3	0.43	-0.38	-1.35	-0.03	0.74	+	+0.21	+0.04	-0.13	0.52
MOUNTAINS																						
Mokhotlong	...	...	Results not available																			

Sorghum Grain in 200 lb. bags per acre (S.F. Series)

LOWLANDS																
Leribe	...	...	...	4.56	16.7	3.33	1.06	4.53	*** +2.02+5.27-0.17	0.36	*** -1.3	*** -5.15	0.67	0.62	*** +2.47-0.67	0.44
Berea	...	...	...	7.56	19.17	7.49	2.1	7.78	+0.11+9.19-0.25	0.69	-0.08	-5.18	+0.59	0.56	1.77	-0.09+0.17
Matsieng	...	...	...						Crop failure							
Mafeteng	...	...	...						Crop failure							
FOOTHILLS																
Machache	...	...	...						Crop failure							

*=Significant at level $P=0.05$

** = Significant at level $P=0.01$

TABLE 3 (W.E. Series)

Wheat Grain in 200 lb. bags per acre

Station	Mean Yield	Coef. of Var. %	Mean Yield Plots without			Linear Responses			Curvatures			Linear Interactions		
			N	P	K	N	P	K	N	P	K	N'P'	N'K'	P'K' S.E. ±
LOWLANDS														
	3.44	17.17	2.45	2.14	3.42	**	**		**	**		**	**	
	...	...	...	...	...	+2.06	+2.11	+0.21	+0.2	-1.49	+0.52	+2.12	+0.11	-0.43 0.34
	...	...	...	...	...	-0.11	+1.65	+0.04	-0.47	-1.17	+0.42	+0.38	+0.14	-0.23 0.36
	...	...	...	...	...	+0.24	+3.52	+0.03	-0.62	-1.56	+0.59	+0.17	-0.02	-0.19 0.4
FOOTHILLS	4.9	14.01	4.68	2.88	4.83	**	**		-0.29	+1.24	+0.61	-0.26	+0.11	0.51
	4.38	20.27	3.81	4.64	4.65	+1.04	-0.12	-0.03	+0.42	-1.13	+2.42	+0.53	-1.7	-1.02 0.84
	10.37	14.06	10.4	7.54	10.75	+0.1	+5.39	+0.06	+0.69					
MOUNTAINS														
	11.7	14.1	11.86	9.42	12.18	+0.02	+4.30	-1.03	0.87					
Mokhotlong	...	...	...	...	...									

* = Significant at level P = 0.05

** = Significant at level P = 0.01

nitrogen, phosphate and potash, where, per acre O — No nitrogen; N1 = 20 lb N and N2 = 40 lb N; P1 = 25 lb P_2O_5 and P2 = 50 lb P_2O_5 ; K1 = 15 lb K_2O and K2 = 30 lb K_2O .

ARRANGEMENT: $3 \times 3 \times 3$ single replicate factorial designs.

Time and method of application: P and K for row crops was drilled 2 to 3 inches below the seed, while N was applied 6 weeks after planting, placed in a band 3 inches from the row on the uphill side. On wheat experiments P and K were broadcast and disced in deeply before planting while the N was spread at the stooling-before-piping stage.

Plot sizes—Maize: Gross $62\text{ft} \times 21\text{ft}$; Nett $58\text{ft} \times 15\text{ft}$. **Wheat and Sorghum—Maize:** 2 feet apart in 3 foot rows. Three seedlings thinned to one per hill. **Sorghum:** 9 inches apart in 3 foot rows. Five seedlings thinned to one per mark. **Wheat:** Broadcast at 40 lb per acre in the lowlands and 90 lb per acre in high country.

VARIETIES—Maize: American White Flint in the lowlands. Cincinnati Bushman in the foothills and mountains. **Sorghum:** Tennant White. One trial that failed to germinate replanted to Texas Martin. **Wheat:** Scheepers and White Spitzkop in the lowlands; Talberg in the foothills and mountains.

SOIL TYPES—Lowlands: Grey-brown and red sandy loam (pH values 5.2—5.5). **Foothills:** Ferruginous red loam, pH 5.3. **Mountains:** Mountain Black Clay, pH $\pm$ 6.6.

CULTIVATION—Row crops: 2 hand and 2 implement cultivations.

WHEAT: None

INSECTICIDES AND FUNGICIDES: All seed treated with mercurial dust. All maize and sorghum twice dusted with DDT powder.

RESULTS: See tables 2 and 3.

DISCUSSION: (N.P.K. Series)

Maize and sorghum yields were average for the series.

Those of Wheat were better.

LOWLANDS AND FOOTHILLS:

The usual large positive linear responses to phosphate are recorded in all crops at all stations save one. As in previous years large negative curvature P responses are also recorded at all stations, the response curve flattening sharply above the level of 100 lbs. per acre of 1:1 phosphate mixture.

The responses to N are inconsistent, though large in some trials. The nitramocal was applied earlier than usual to the winter wheat trials,—in August, at the early stooling stage. The N responses at Leribe and Berea are the largest recorded for wheat in this section. At Machache (summer wheat) the Nitramoncal was applied late, at the piping stage. This may account for the lack of effect of N there.

The soils of Basutoland patently contain adequate supplies of available potash.

The high wheat yield at Machache is of interest. For the last three seasons the establishment of plots without phosphate has been poor and yields extremely low. There was evidence of toxic effects. In the winter of 1956, in the light of results from the adjoining lime trial,

(8 m.D.P.L. below) the whole experiment site was limed at the rate of 3 tons per acre. The effect was apparent soon after germinations; the young crop for the first time having a healthy green colour. The yield effect of the basal lime is assessed at 10 bags per acre in the absence of phosphate and 5 bags in its presence.

Unfavourable climatic conditions were responsible for the failure of three sorghum trials.

It was not possible to complete the statistical analysis of the mountain trials by September 30th.

3 NITROGEN MANURING

Four trials on nitrogenous fertilizer for maize were laid down on the Experiment Station.

(1) Rate of N, Time of Application and Plant Espacement.

The annual trial was redesigned and duplicated so that comparative results could be obtained from grey-brown sandy loam and doleritic red sandy loam. There is some evidence from more than 100 results from the N.P.K. series that response to N. is related to soil type in the lowlands.

ARRANGEMENT: $4 \times 4 \times 2$ factorial design in 2 blocks of 16 plots with 3 replicates.

TREATMENT: (Rates per acre.)

n0=No nitrogen	S1=Plants 3ft $\times$ 6ins.	T1=Applied 6 wks.
n1=20 lb. N	S2=Plants 3ft $\times$ 12ins.	T2=Half at 6 wks.
n2=40 lb. N	S3=Plants 3ft $\times$ 18ins.	half at tasseling.
n3=60 lb. N	S4=Plants 3ft $\times$ 24ins.	

APPLICATION: N, as Nitramoncal, placed in 3ins band 3ins. from row

BASAL: 300 lb. supers per acre.

VARIETY: American White Flint.

RESULTS: See tables 4 and 5.

TABLE 4 (Ex. M.N. 1)
(Grey-brown Sandy Loam)
Maize Grain in 200 lb. bags per acre

	S1	S2	S3	S4	Mean	S.E. $\pm$ 0.48
			S.E. $\pm$.96			
N0	5.18	6.28	8.05	9.96	7.36	
N1	7.86	11.0	10.42	10.27	10.27	
N2	11.85	14.61	13.12	11.38	12.85	
N3	15.42	18.06	16.87	14.12	16.10	
Mean	10.07	12.48	12.46	11.58	11.65	

S.E. $\pm$ 0.48

	T1	T2	Table @ (Ex. M.N. 1). (Grey-brown Sandy Loam) S.E. ± 0.68
N0	7.02	7.73	
N1	10.42	10.17	
N2	12.95	12.81	
N3	16.10	16.18	
S1	9.14	11.03	
S2	13.27	11.73	
S3	12.10	12.87	
S4	11.97	11.24	
Mean	11.62	11.72	

S.E. ± 0.34

Maize Grain in 200 lb. bags per acre.

	S1	S2	S3	S4	Mean	S.E. ± 0.26
N0	6.26	6.79	S.E. $\pm .51$ 5.71	4.76	5.88	
N1	8.49	8.66	7.91	6.49	7.89	
N2	10.31	9.38	7.40	6.56	8.41	
N3	10.04	10.37	8.63	5.98	8.76	
Mean	8.78	8.80	7.41	5.95		

S.E. ± 0.26

	T1	T2	TABLE 5. (Ex. M.N. 3) (Red Sandy Loam) S.E. ± 0.36
N0	5.49	6.28	
N1	7.78	8.0	
N2	8.57	8.25	
N3	9.25	8.69	
S1	8.86	8.69	
S2	9.08	8.52	
S3	7.15	7.68	
S4	5.99	5.91	
Mean	7.77	7.70	

S.E. ± 0.18

DISCUSSION: It is evident that response by maize to nitrogen is closely related to plant population. Both trials were damaged by hail at the cobbing stage, that on the red sandy loam more severely than the other. The question of possible extraordinary demand for N following the hail damage must be taken into account as must the fact that the

soils were sodden for so long. The results, however, confirm those from other sites in three previous seasons. In the other trials with nitrogenous fertilizers the 3ft × 12ins. spacing was used. (see below)

(2) Form of Nitrogen and Method of application.

It has been shown elsewhere that the conjoint application of N and P at the time of planting can markedly effect nutrient uptake by maize when compared with separating of the two nutrients in space, even by an inch or two of soil. A small trial was laid down in Maseru.

TREATMENTS: No nitrogen (superphosphate only)

40 lb. N per acre mixed with supers and drilled at planting.

40 lb. N. per acre side dressed six weeks after planting.

20 lb. N. per acre mixed with supers and drilled at planting plus

20 lb. N. per acre side dressed at six weeks.

N supplied as sulphate of ammonia vs. N supplied as Nitramoncal.

ARRANGEMENT: Randomised blocks. *SPACING:* 3ft × 12ins.

VARIETY: A.W.F. *SOIL:* Grey-brown sandy loam, pH 5.4.

RESULTS: See Table 6.

TABLE 6 (Ex. M.N. 4)
Maize Grain in 200 lb. bags per acre.

Method of Application	Form of Nitrogen	Mean Yield	Mean
—	No nitrogen	8.10	8.10
All as side-dressing ...	Sulph. Amm.	13.69	14.02
" "	Nitramoncal	14.35	
All as mixture	Sulph. Amm.	14.73	14.51
" "	Nitramoncal	14.27	
($\frac{1}{2}$ as side-dressing)	Sulph. Amm.	14.84	14.58
($\frac{1}{2}$ as mixture)	Nitramoncal	14.34	

Mean	13.47
S.E. Mean Yields	± 0.60
L.S.D. (5%)	1.72
Variance ratio	16.08
F. requirement	2.42
Coef. of variation	10.9%

DISCUSSION: All treatment significantly increased yields but no significance could be attached to differences in yield due to the different forms of nitrogenous fertilizer and different methods of application. The abandonment in the research programme in 1955/56 of sulphate of ammonia as a source of fertilizer nitrogen in favour of Nitramoncal, because of the low state of buffer of lowland soils, would

appear to have been justified. Again it must be noted that the season was a "wet" one and the trial was damaged by hail.

(3) Nitrogen and Monoculture.

The possibility exists that productivity can be maintained at a high level over a long period in a system of continuous maize grown in dense high yielding stands with all plant residues incorporated with heavy dressings of nitrogenous fertilizer, other fertilizers being supplied as necessary. The question of minimising the loss of fertilizer N by leaching and its retention in the soil in organic form also enters.

In this, the first season of the trial, stover equivalent to that produced locally from a 20 bag acre crop was applied to plots.

TREATMENTS: Whole plots: Winter Treatments:

O = No stover (presumed grazed off) and no nitrogen.

N1 + s = 20 lb N per acre plus 2 tons dry stover ploughed in.

N2 + S = 40 lb. N per acre plus 2 tons dry stover ploughed in.

N1 = 20 lb. N per acre ploughed in without stover.

N2 = 40 lb. N per acre ploughed in without stover.

Sub plots: Summer Treatments:

O = No nitrogen side dressed.

Side N = 20 lb. N per acre side dressed at 6 weeks.

ARRANGEMENT: Randomised blocks with split plots. *BASAL:* 400 lb. super per acre. *VARIETY:* A.W.F. *SOIL:* Grey-brown sandy loam.

SPACING: 3ft x 12ins.

RESULTS: See Table 7.

TABLE 7 (Ex. M.N. 2)
Maize Grain in 200 lb. bags per acre

		Summer side dressing		Mean
		0	N1	
Winter Treatments	0	6.47	10.62	8.55
	N1	15.09	16.72	15.90
	N2	19.64	19.52	19.58
	N1 + S	12.77	14.90	13.84
	N2 + S	17.00	20.11	18.56
	S.E.	± 1.12	± 1.12	± 1.03
Mean	14.19	16.37	15.28	

S.E. = ± 0.27

S.E. Summer Treatments within winter treatments = ± 0.6

S.E. difference any two means ± 1.12.

DISCUSSION: Nitrogenous fertilizer ploughed in in winter significantly increased yields, whether or not a further side dressing was given to young crop. Thus in the absence of a side dressing N2 N1 and

$N1 + S\ 0$ and $N2 + S\ N1 + S\ 0$. Where a side dressing was given $N2$ and $N2 + s\ N1 + S\ 0$.

The side dressing 6 weeks after planting increased yields where no nitrogen had been applied in winter (and no stover ploughed in) but it had no effect following a winter application to soil without stover. Where, however, the winter application was ploughed in with 2 tons of dry stover per acre the side dressing produced an additional significant response. The 40 lb. N per acre was apparently insufficient to meet the requirement of the crop while decomposition of the stover took place.

The size of the response to N in this and the former trial is noteworthy. Both trials were planted at the rate of 15,000 plants per acre and both received heavy basal dressings of phosphates. (Both were hail damaged in a wet season).

4 PHOSPHATE.

The long term experiment on forms and rates of phosphatic fertilizer was continued at Maseru. This important trial was ruined by the theft of ears by herd boys. Adjustment of yields was attempted but no satisfactory result could be obtained on direct conversions.

5 POTASH.

The annual trial on rates of muriate of potash on a mountain black clay derived from basalt was continued at Mokhotlong with summer wheat. There were no differences in yield due to applications of K at rates between nil and 40 lb. K_2O per acre. The mean yield was high.

It was considered that the "Mountain Black Clays" might be found to be deficient in potash but in four years no responses to K have been recorded. The trial will be discontinued.

6 LIMING

Results to date have shown the benefits of liming the lowland red sandy loams associated with doleritic intrusions and the foothill red loams on basalt, and the danger of liming the lowland grey-brown sandy loams. Four trials were continued and two new ones, intended as long term investigations, were laid down at Maseru.

(1) D.P.L. Series.

The trials at Machache and Maseru continued, with beans.

TREATMENT: Factorial combinations of three rates of total P_2O_5 applied as kraal manure (D0, D1 and D2), three (the same) rates of total P_2O_5 applied as 1:1 super-raw rock phosphate fertilizer (P0, P1 and P2) and three rates of high Carbonate agricultural lime (L0, L1 and L2) where:

D0=No kraal manure.

D1 = Kraal manure in quantity to give 25lb. P_2O_5 per acre.

D2=Kraal manure in quantity to give 50lb. P_2O_5 per acre.

P0=No phosphate fertilizer.

P1=25lb. P_2O_5 per acre as 1:1 mixture.

P2=50lb. P_2O_5 per acre as 1:1 mixture.

L0=No agricultural lime per acre.

L1 =3,000 lb. agricultural (calcitic lime per acre. } 1954.

L2 =6,000 lb. agricultural (calcitic) lime per acre. }

Manure is applied to D plots every three years, fertilizer being applied in other years. A rotation of maize, maize beans is followed.

SOIL TYPES: at Maseru: Residual grey-brown (solodised solonetzic sandy loam derived from sandstone, pH 5.4.) (At Machache: Residual red loam derived from basalt, pH 5.3.

ARRANGEMENT: 2 replicate $3 \times 3 \times 3$ designs. *BASAL:* Nil.

VARIETIES: White Haricot at Maseru, Pink Wachter at Machache.

SPACING: 3ft $\times$ 6ins.

RESULTS: The experiment at Machache was destroyed by hail. That at Maseru was lightly damaged. See Table 8.

TABLE 8 (EX.M.D.P.L.)

Bean Grain in 200 lb. bags per acre

(Lowland grey-brown sandy loam)

P applied as fertilizer

L (Lime)

		P0	P1	P2	L0	L1	L2	Mean
P applied as Manure	D0	2.32	2.43	2.73	2.04	2.58	2.86	2.49
	D1	2.92	3.12	3.84	2.50	3.64	3.74	3.29
	D2	3.45	3.67	4.79	3.0	4.09	4.82	3.97
	Mean	2.90	3.07	3.79	2.51	3.44	3.81	3.25

P applied as Fertilizer

L (Lime)

	L0	L1	L2
P0	2.08	2.35	4.26
P1	2.47	3.62	4.13
P2	2.98	4.35	4.03

Standard error means= ± 0.43

Standard error all figures= ± 0.43

DISCUSSION: The responses to residual manure and lime and to phosphate are marked. Previous maize crops have not responded to lime on this site and in the first it induced severe chlorosis. The result from the present maize crop will determine whether this change is

one related to type of crop or to temporary nutrient imbalance or deficiency caused by liming.

Until they were destroyed the bean plants on limed plots on the Machache experiment were considerably larger than those on plots without lime. The significance of this is dealt with in the section on minor elements.

(2) M.L. Series.

Two simple trials with various rates of liming for maize were repeated at Teyateyaneng and Matsieng. As with the previous pair two different soil types were used, in this case the two main types found in the lowlands. The crops were White Haricot beans.

TREATMENTS: Rate of calcitic agricultural lime where:—

L0=No agricultural lime	} Applied in 1953.
L1=1,000 lb. lime per acre	
L2=2,000 lb. lime per acre	
L3=3,000 lb. lime per acre	
L4=4,000 lb. lime per acre	

ARRANGEMENT: At Matsieng: 5 × 5 Latin Square. At Teyateyaneng 4 randomised blocks of 5 plots each.

SOIL TYPES: At Teyateyaneng: Grey-brown sandy loam, pH 5.3.

At Matsieng: Red (doleritic) sandy loam, pH 5.5. *BASAL:* Superphosphate at 200 lb. per acre; drilled below seed.

RESULTS: See Tables 9 and 10.

TABLE 9 (2 M.L.)

Bean Grain in 200 lb. bags per acre.

(a) Acid grey-brown sandy loam, pH 5.3.

	1954(Maize)	1955(Maize)	1956(Maize)	1957(Beans)
Treatment	Mean Yield	Mean Yield	Mean Yield	Mean Yield
L0	11.09	5.76	4.06	2.17
L1	12.20	6.52	4.46	2.13
L2	12.05	6.46	4.93	4.17
L3	10.58	6.92	4.16	4.48
L4	10.09	5.83	4.05	4.38
Mean	11.20	6.30	4.33	3.67
S.E. Mean				
Yields±	0.69	0.43	0.21	0.33
Variance				
Ratio	1.76	1.34	2.62	9.18
F. require- ment	3.26	3.26	3.26	3.26

TABLE 10 (3 M.L.)

Bean Grain in 200 lb. bags per acre
(Red Sandy Loam)

Treatment	1954(Maize)	1955(Maize)	1956(Maize)	1957(Beans)
	Mean Yield	Mean Yield	Mean Yield	Mean Yield
L0	9.55	7.45	3.21	3.02
L1	11.42	7.37	3.05	3.31
L2	12.06	7.76	3.95	3.54
L3	12.72	8.29	4.81	3.63
L4	12.90	8.26	4.63	3.46
Mean	11.73	7.83	3.93	3.39
S.E. Yields	0.42	0.47	0.36	0.14
Var. Ratio	11.19	0.1	5.05	2.62
F. require- ment	3.26	3.26	3.26	3.26

DISCUSSION: Again, on a grey-brown sandy loam on which three previous maize crops had not been affected by liming, there was a large response in beans. The Matsieng crop was cut by hail. This undoubtedly reduced the yield and effects.

(3) Lime, Fertilizer and Manure.

Two new trials were laid down on the Experiment Station, one on grey-brown sandy loam (ex sandstone) and the second on red sandy loam on dolerite.

TREATMENTS: Forms and rates of lime, applied in July, 1956, where on whole plots, per acre:—

O=No lime.

1 Mg=1 ton dolomitic lime 1 Ca=1 ton calcite lime.

2 Mg=2 tons „ „ 2 Ca=2 tons „ „

3 Mg=3 tons „ „ 3 Ca=3 tons „ „

On Sub-Plots

P=50 lb. P_2O_5 per acre as superphosphate

D=50 lb. P_2O_5 per acre as manure.

ARRANGEMENT: Randomised blocks with split plots. *BASAL:* Nil.

SPACING: 3ft×18ins. *VARIETY:* A.W.F.

RESULTS: See Tables 11 and 12.

TABLE 11 (EX M.L.2.)
Maize Grain in 200 lb. per acre
(Grey-brown Sandy Loam)

Treatment	With Manure	With Super-phosphate	Mean
(—)	10.79	6.57	8.68
Mo	10.26	6.75	8.5
1Ca	10.46	3.45	6.95
2Ca	9.69	4.67	7.18
3Ca	10.27	3.49	6.88
1Mg	10.08	4.44	7.26
2Mg	11.65	6.41	9.03
3Mg	11.52	7.00	9.26
Mean S.E.(means)	10.59	5.35	7.97 ±1.24

TABLE 12 (Ex. M.L.1)
Maize Grain in 200 lb. bags per acre
(Red Sandy Loam)

Treatment	With Manure	With P. Fertilizer	Mean
(—)	7.84	6.76	7.3
1Ca	7.84	6.61	7.23
2Ca	7.63	6.93	7.3
3Ca	7.09	6.92	7.00
1Mg	7.75	6.96	7.35
2Mg	8.73	6.82	7.77
3Mg	8.94	5.83	7.38
Mean S.E.	7.96	6.7 ±0.15	

DISCUSSION: The experiments suffered from waterlogging and hail damage. Plant losses were high. No conclusions should be drawn from the results.

(a) *Red Sandy Loam, pH 5.5:* In the presence of manure the calcitic lime reduced yields while the dolomitic lime produced appreciable increases. Where superphosphate but no manure was applied most plants showed symptoms of "yellowing", a disturbance which has since been claimed in the Union to be due to deficiency of zinc (c.f. "white bud").

(b) *Grey-brown Sandy Loam, pH 5.4:* Manure significantly outyielded superphosphate. The effect of the lime treatments is barely significant.

Again "yellowing" was most severe on limed plots without manure. It did not occur where manure was applied.

In an attempt to save the trials a heavy basal dressing of a 20:20 NP mixture was applied 10 weeks after planting, the fertilizer placed next to plants by means of an injector gun. Growth and colour improved soon afterwards.

Because of the shortage of land on the station and the dissection of all lands by contour banks into narrow strips the size of limed plots was small (15ft×60ft.) On the grey-brown sandy loam site in particular there was a marked "creep" of carbonate down the 3% slope in one season. Typically the vertical drainage of these soils is poor while water readily moves laterally along the top of the heavy clay subsoil. Both sites will be abandoned after one further crop. A serious problem in experiment lay-out is presented.

7. MINOR ELEMENTS.

Trials with minor elements were carried out at Maseru and Teyateyaneng (grey-brown sandy loams), at Machache (Foothill red loam), and at Mokhotlong (Mountain Black clay.)

(1) Minor Elements on a Mountain Black Clay.

The trial at Mokhotlong was continued with wheat. The following treatments were compared:—

- O=No trace element.
- Cu=10 lb. copper sulphate per acre.
- Zn=5 lb. Zinc sulphate per acre.
- Mn=15 lb. manganese sulphate per acre.
- B=5 lb. borax per acre.

All plots received a basal dressing of superphosphate.

RESULTS: There were no significant differences between treatments.

(2) Minor elements on Grey-brown Sandy Loams.

(a) *At Maseru: Treatments:* Factorial combinations of the presence and absence of six salts, applied broadcast and harrowed in before planting, where, per acre:—

- Cu=10 lb. copper sulphate.
- Zn=5 lb. zinc sulphate.
- Mg=50 lb. magnesium sulphate.
- Mn=15 lb. manganese sulphate.
- B=5 lb. borax.
- Mo=2 oz. Molybdenum trioxide.

ARRANGEMENT: 6 half replicate factorial design. **CROP:** Wheat.

RESULTS: There were no significant effects on interactions.

(b) *At Teyateyaneng:* A similar trial on maize, but excluding molybdenum, was planted on a similar soil. The site had been fallowed the previous season.

RESULTS: There were no significant results. The largest effects were

those of B and Mg. The 5 lb. per acre (broadcast) application of zinc sulphate did not prevent "yellowing".

(3) Minor Elements on a Foothill Red Loam, pH.

TREATMENTS: Factorial combination of the presence and absence of salts as follows:—

Cu=10 lb. copper sulphate per acre.

Zn=10 lb. zinc sulphate per acre.

Mg=50 lb. magnesium sulphate per acre.

Mn=15 lb. manganese sulphate per acre.

B/Mo=10 lb. borax plus 4 ozs. molybdenum tri-oxide per acre.

BASAL: A very heavy basal dressing was given, as follows:

400 lb. supers plus 100 lb. muriate + 200 lb. Nitramoncal per acre. Salts mixed with basal, applied broadcast and harrowed in.

Crop: Maize. *Variety:* S.A. 200 double hybrid.

RESULTS: See Table 13.

TABLE 13 (8. M. Min)
Maize Grain in 200 lb bags per acre
Response with

Mean Fctr.Resp	Cu		B/Mo		Zn		Mg		Mn	
	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
Cu -0.2	—	—	-0.23	-0.17	0.33	0.73	0.15	0.25	0.57	-0.97
B/Mo 1.42	1.39	1.45	—	—	1.88	0.96	1.11	1.74	1.73	1.11
Zn 1.42	0.81	-0.25	0.74	-0.18	—	—	-0.58	1.14	0.39	0.17
Mg 0.07	0.12	0.02	-0.24	0.38	-0.79	0.93	—	—	-0.41	0.55
Mn 1.15	1.92	0.38	1.46	0.84	1.26	1.04	0.67	1.63	—	—
S.E. ± 0.31			± 0.43							

Mean Yield=12.1

Coefficient of Variation=7.1

DISCUSSION: The experiment was precise and the yield good. The effects of Mn and B/Mo are significant at the 1% level and various interactions at $P=0.05$.

While the responses are small they are of great interest and are considered important, particularly in view of (1) the heavy basal fertilizer dressing, (2) the crop being maize, and (3) the results from liming on the foothill red loam (where responses to lime of 1,300 lbs. grain per acre have been recorded.)

The B and Mo were mixed as one treatment because of a shortage of land for the experiment. The effect of B/Mo has since been showed to be a response to Molybdenum.

The question of molybdenum deficiency is being intensively investi-

gated, both in the field, where 23 minor element experiments have been laid down, and in greenhouse pot experiment.

8 RESIDUAL EFFECTS

(1) Manure, Ash and Fertilizer.

The trial with manure, manure ash and superphosphate was continued at Maseru. Maize was used to measure first year residual effects.

ARRANGEMENT: 5 randomised blocks of 10 plots each.

TREATMENTS: Rates of manure, manure ash and phosphate fertilizer, where:—

O=No treatment.

D =Kraal manure.

P=1:1 mixture of Raw Moroccan Rock and supers.

A=Manure ash.

1=At a rate to give 25 lb. P_2O_5 per acre.

2=At a rate to give 50 lb. P_2O_5 per acre.

3=At a rate to give 75 lb. P_2O_5 per acre.

P. ANALYSES: Manure 0.92% P_2O_5 , Ash 1.97% P_2O_5 , 1:1 mixture 26% P_2O_5 .

BASAL:

RESULTS: See Table 14.

TABLE 14 (Ex. M.D.P.A.)

Maize Grain in 200 lb. bags per acre

Treatment	Mean Yield
0	4.35
P1	4.52
A1	4.68
P2	4.77
P3	4.93
D1	5.08
D2	5.16
A3	5.26
A2	5.47
D3	5.86
Mean	5.01
S.E. Mean Yields	0.31
L.S.D. 5% ...	0.89
Var. Ratio ...	2.18
F. requirement	2.15

DISCUSSION: A3, A2 and D3 significantly outyielded the control. The trial was badly cut by hail.

(2) Manure and Fertilizers.

The long term experiment started in 1953 was continued. Directly manured maize is followed by an unmanured bean crop to measure first year residual effects and the beans in turn by wheat for second year residuals. In the wheat comparison is also made with direct phosphate. The first year residual effects of phosphate is therefore again measured in the subsequent manured maize crop where it is compared with direct nitrogen, phosphate, potash (as fertilizer) and manure.

TREATMENTS: Factorial combinations of the presence and absence N, P, K, D and P' where:—

Applied to Maize only.

N=40 lb. N per acre as sulphate of ammonia.

P=50 lb. P_2O_5 per acre as 1:1 mixture.

K=30 lb. K_2O per acre as muriate of potash.

D=50 lb. P_2O_5 per acre as kraal manure.

Applied to Wheat only.

P'—50 lb. P_2O_5 per acre as 1-1 mixture.

ARRANGEMENT: 25 two replicate factorial design in 8 blocks of 8 plots each, repeated on three sites, each site in any one year carrying one phase of a three course rotation of maize, beans, wheat.

SOIL TYPE: Grey-brown sandy loam.

RESULTS: See Table 15.

TABLE 15

Maize Grain in 200 lb. bags per acre

Responses with

Fctr	Mean	N		P		K		D		P'	
	Resp.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.	Abs.	Pres.
N	1.64	—	—	0.9	2.37	1.70	1.58	1.08	2.19	1.22	2.05
P	1.41	0.67	2.14	—	—	0.55	2.26	2.47	0.34	1.96	0.86
K	0.28	0.33	0.22	-0.58	1.13	—	—	0.06	0.49	0.30	0.25
D	2.56	2.01	3.12	3.63	1.50	2.35	2.77	—	—	3.2	1.93
P'	0.08	-0.34	0.49	0.63	-0.47	0.10	0.05	0.71	-0.55	—	—
S.E.	+0.29					±0.41					

Mean Yield=9.65

Coefficient of variation=8.5%

DISCUSSION: (a) *Directly Manure Maize:* The responses to manure and phosphate require no comment. The response to nitrogen is of interest as is the PK interaction, (b) *BEANS:* The bean crop was destroyed by hail. (c) *WHEAT:* There were no significant differences between treatments.

9 A TILLAGE EXPERIMENT

The most widespread soil of the Basutoland lowlands is a grey-

brown or brown sandy loam, (Solodised Solonetz) typified by a shallow top soil with weak structure on a heavy yellow clay subsoil. These occur mainly in the Maseru District and southwards; the soils to the north, with increasing rainfall, tending more towards the podsol type. Mention has been made of the poor drainage properties of the soils in the section on liming. The base status of the topsoil is low while that of the subsoil is very high.

Through continuous cropping without manuring large areas of soil in the lowlands are completely impoverished and structureless. They readily become waterlogged in summer and blow in the winds of August and September. Thousands of acres have been abandoned.

It was considered that deep ploughing, leading to the inversion of the top inches of the sub-soil, might improve their physical properties and at the same time make more nutrients available nearer the surface; that a general revitalisation might occur.

A small trial was laid at Maseru.

TREATMENTS:

Normal 6ins ploughing (4 ox single furrow plough).

Normal 6ins ploughing plus subsoiling by tractors ("Ferguson")

Deep 20ins ploughing (D6 "Caterpillar" tractor and "Solotrack" plough).

Deep 20ins ploughing plus 300 lb. gypsum per acre, harrowed in.

BASAL: 300 lb. superphosphate + 200 lb. Nitramoncal per acre.

ARRANGEMENT: Randomised blocks. *VARIETY*: A.W.F.

RESULTS: See Table 16.

TABLE 16 (Tillage Trial)

Maize Grain in 200 lb. bags per acre

Treatment	Mean Yield
6 ins. ploughing	15.49
6 ins. ploughing + subsoiling	16.05
20 ins. ploughing	16.23
20 ins. ploughing + gypsum ...	18.44
Mean	16.55
S.E. Mean Yields	± 0.09
L.S.D. (5%)	0.30
Var. ratio	224.6
F. requirement	4.76

DISCUSSION: The result is interesting and may be important. The heavy dressing of fertilizer given to all plots may somewhat have

obscured the treatment effects. The possibility of a sulphur deficiency in this soil is being investigated.

10 WEED CONTROL IN MAIZE

The experiment on methods of weed control was continued on a new site.

TREATMENTS: Methods of weed control where:—

O=No Weed control.

Postspray Post-emergent spray of 2.4D at 1 pint per acre.

Prespray Pre-emergent spray of 2.4D at 2 pints per acre.

Postspray + 1C Postspray as above plus one implement cultivation.

2C=Two implement cultivations.

3C=Three implement cultivations.

HC=Clean hand cultivation.

HC + 1C One hand cultivation plus one implement cultivation.

(Prespray 5 days after planting, postspray when maize 4ins. to 6 ins. tall.

2 pints amine salt contain 1 lb. acid equivalent)

BASAL: 200 lb. superphosphate per acre.

RESULTS: See Table 17.

TABLE 17
Maize Grain in 200 lb. bags per acre

Treatment	Mean Yields			
	1954	1955	1956	1957
O	1.82	1.37	2.40	0.53
Prespray	5.40	2.98	9.33	1.04
Postspray	3.62	2.31	8.30	2.12
Prespray=1C ...	8.25	3.66	16.08	2.57
2C	8.40	5.82	13.57	3.30
Postspray + 1C ...	7.18	5.69	17.52	3.61
3C	7.20	6.05	14.39	3.62
HC + 1C	—	7.27	16.04	6.61
HC	11.97	7.25	12.94	7.05
Mean		4.71	12.06	3.38
S.E. Mean Yields ±	0.56	0.49	0.68	0.52
L.S.D. 5%	1.63	1.40	1.93	1.48
Var. ratio	31.10	19.40	20.54	18.43
F. requirement ...	2.36	2.18	2.18	2.18

DISCUSSION: The site was a poor one and the yields were low. The value of clean hand cultivation is demonstrated.

11 WINTER LAND USE

All arable lands in Basutoland are heavily grazed on a communal

basis after the harvest. The grazing is usually followed by the removal of remnant stalks and the dung for fuel. This practice must have an important bearing on soil fertility.

The experiment commenced in 1955 was continued

TREATMENTS:

1. No grazing after harvest.
2. 1,500 large stock grazing hours per acre.
3. 1,500 large stock grazing hours per acre with remnant stover removed.
4. 1,500 large stock grazing hours per acre with dropped dung removed.
5. 1,500 large stock grazing hours per acre, with dropped dung and remnant stover removed.

ARRANGEMENT: Randomised blocks.

BASAL: 200 lb. superphosphate per acre. **SOIL TYPE:** poorly drained grey-brown sandy loam.

RESULTS: There were no significant differences. Effects will no doubt appear only after several years of treatment.

12 FARM TRIALS

In order to accumulate data on the economics of fertilizer use a number of small fertilizer experiments are laid out on typical Basuto farms each year. In 1956/57, 27 trials were planted.

The Farmer, after the experiment was pegged out and the fertilizer applied and ploughed in, planted and tended the crop in his normal manner.

TREATMENTS: Four rates of 1:1 phosphate mixture, where:—

- P0—No fertilizer.
- P1=75 lb. per acre.
- P2=150 lb. per acre.
- P3=225 lb. per acre.

ARRANGEMENT: Randomised blocks.

CROP: Maize (various varieties) throughout.

RESULTS: See Table 18.

DISCUSSION: Of the 27 experiments planted 9 were lost. The results from the trials harvested agree closely with those of previous seasons.

Every effort was made to obtain results under “average” circumstances. This being the case attention can be drawn to the low level of yields in the Territory.

While the main cause is low soil fertility considerable yield increases could be achieved by planting maize thicker.

A plant population of about 10,000 per acre should be aimed at where no nitrogenous side dressing is to be given. During the season a number of random counts were made and an average stand of 3,800 plants per acre was recorded.

The results clearly demonstrate that fertilizing is profitable even under present farming standards. At producers prices of 25/- per bag

for maize and 15/- per 100 lb. for the fertilizer, mean nett profits per acre were as follows:—

Fertilizer rate per acre	75 lb.			150 lb.			225 lb.		
	£	s.	d.	£	s.	d.	£	s.	d.
First year application		14	3	1	0	3	1	5	9
Second year of application	1	3	0	1	2	6	1	5	6
Residuals after one application ...		11	3	2	1	6	1	15	0

TABLE 18
FARM TRIALS 1956/57

Maize Grain in 200 lb. bags per acre

Direct effects:

Area	Liptonkoeng	Qolathoe	Khanyane	Mesapela	Mapot	Qaba's	Qomo-Qomong	Alwynskop	Mean
Soil pH									
Treatment	Mean Yield								
P0 ...	6.86	4.44	1.13	1.61	6.33	3.63	5.24	5.51	4.34
P1 ...	7.26	6.05	2.14	4.04	5.92	4.64	6.59	5.92	5.32
P2 ...	8.07	5.3	2.82	5.25	7.13	5.85	7.80	6.48	6.05
P3 ...	6.86	4.07	3.03	5.65	8.21	8.07	9.01	5.24	6.26
Mean	7.27	4.95	2.28	4.14	6.9	5.57	7.16	5.71	5.5
S.E. +	—	—	—	0.15	—	0.09	0.4	—	—
L.S.D. (5%)	—	—	—	0.52	—	0.32	1.38	—	—
Var. ratio	1.63	1.5	4.61	145.8	2.1	46.5	16.5	1.93	—

Second Year Accumulative Effects:

Area	Majara	Pitseng	T.Y.	Mejaro	Mekaling	Panta	Sebapala		Mean
Soil pH									
Treatment	Mean Yield								
P0 ...	0.81	1.14	1.34	4.98	1.21	1.21	1.88		1.80
P1 ...	2.42	3.36	2.56	6.73	2.15	1.61	3.36		3.36
P2 ...	3.56	3.36	3.36	7.00	2.29	1.75	3.76		3.58
P3 ...	4.71	4.44	4.44	7.00	2.29	1.56	4.57		4.17
Mean ...	2.87	3.08	2.92	6.42	1.97	1.44	3.40		3.17
S.E. $\pm$	0.25	0.57	0.18	0.34	—	—	0.31		
L.S.D.(5%)	0.86	1.97	0.63	1.16	—	—	1.07		
Var. ratio	44.9	6.4	51.9	8.36	4.00	0.60	3.18		

First Year Residual Effects: (following one dressings of fertilizer).

Area	Sekamaneng	Qalaheng	Moletsane						Mean
Soil pH									
Treatment	Mean Yield								
P0 ...	2.15	5.11	0.94						2.73
P1 ...	3.36	6.06	1.48						3.63
P2 ...	5.65	8.88	1.34						5.29
P3 ...	6.19	11.03	1.61						6.28
Mean	4.34	7.77	1.54						4.48
S.E. $\pm$	0.36	0.78	—						
L.S.D.(5%)	1.26	2.69	—						
Var. ratio	27.6	12.1	2.43						

F. requirement (5%)=4.76

13 CROP STUDIES

Details of the aims of the work on crop varieties and techniques used were given in the report of 1954.

MOUNTAINS AND FOOTHILLS

(1) Wheat.

(a) The eight best selections from the original 81 lines were again compared in variety trial at Mokhotlong.

(b) 25 commercially available varieties were sown in non-replicated plots at Mokhotlong for observation.

(2) Sorghum.

Eight selections were made from the 16 sorghums grown at Machache (Originally 320).

LOWLANDS

(1) Maize.

(a) 16 varieties were compared in an early planted trial which failed.

(b) 9 short season varieties were tested for early December planting.

ARRANGEMENT: Randomised blocks. *SPACING*: 3ft. $\times$ 12ins.

RESULTS: See Table 19.

TABLE 19
Maize Grain in 200 lb. bags per acre

Variety					Mean Yield
Peruvian	...	...	...	...	14.68
Cincinnati	...	...	...	...	14.97
Yellow Bushman	...	...	...	...	15.42
Wisconsin	...	...	...	...	15.42
White Bushman	...	...	...	...	15.64
Natal 8-Row	...	...	...	...	16.32
SA 200	...	...	...	...	19.02
Mean	...	...	...	...	15.92
S.E. Mean Yields	...	...	...	...	± 0.56
Variance ratio	...	...	...	...	6.87
F. requirement	...	...	...	...	2.51

Coef. of variance 7.84%

DISCUSSION: The performance of the double hybrid SA 200 is of interest. The high mean yield in spite of hail damage is attributed to a nitrogenous side dressing.

(2) Wheat.

(a) 36 lines of summer wheat were sown for observation. They were badly damaged by hail and no yields were recorded.

(b) The annual trial of 25 varieties of winter wheat was continued at Maseru.

ARRANGEMENT: 5 $\times$ 5 lattices with 4 replications. *SEEDING*: 40 lb. per acre, broadcast. *BASAL*: 200 lb. superphosphate per acre.

RESULTS: See Table 20.

TABLE 20

Wheat Grain in 200 lb. bags per acre

Early Planted				Late Planted			
Variety	Mean Yield			Variety	Mean Yield		
	1954	1955	1956		1954	1955	1956
Red Victory	1.78	4.18	3.73	Red Victory	1.29	5.85	5.28
Scheepers ...	3.32	4.55	3.6	Queen Fan ...	1.52	5.22	4.8
Red Spitzkop	3.72	3.81	3.39	Talberg ...	2.1	4.34	4.63
Roussouws				Mountain No.1	2.16	4.85	4.55
Baard ...	3.18	3.53	3.32	Mountain No. 2	1.55	4.55	4.55
Lowland No.1	3.00	4.48	3.26	Lowland No. 1	1.9	5.47	4.25
Punjab ...	3.79	3.67	3.06	Red Spitzkop	2.25	4.65	3.81
Maluti ...	3.17	4.11	3.03	Scheepers ...	1.82	4.41	3.79
White Spitzkop	3.84	3.55	2.97	Maluti ...	2.41	5.03	3.66
Penkop ...	3.26	3.73	2.84	Penkop ...	1.61	4.76	3.64
Red Egyptian	3.2	4.55	2.82	White Spitzkop	2.47	4.65	3.52
Harpers... ..	2.82	3.91	2.81	Goudveld ...	1.82	4.34	3.45
Mountain No.2	2.36	3.64	2.81	Red Egyptian	2.45	5.49	3.37
Talberg ...	2.34	3.63	2.74	Punjab ...	2.07	5.48	3.31
Mountain No.1	1.98	3.52	2.69	Lalkasarwali	1.94	3.63	3.28
Vorentoe... ..	2.59	2.86	2.61	Roussouws			
Sterling ...	2.91	3.84	2.48	Baard ...	1.81	4.82	3.15
Impala ...	2.86	3.75	2.46	"Manitoba"	1.42	3.74	3.06
Hoopvol ...	2.89	3.42	2.43	Harpers ...	1.76	4.74	2.97
Goudveld ...	3.37	3.45	2.36	Vorentoe ...	1.82	4.52	2.82
Daeraad ...	2.94	3.55	2.31	Sonop ...	1.74	3.57	2.58
Lalkasarwali	2.43	2.81	2.27	Sterling ...	1.78	4.18	2.45
Duiker ...	2.09	2.95	1.92	Impala ...	1.83	4.38	2.43
Sonop ...	2.89	3.34	1.92	Duiker ...	1.72	3.06	2.13
"Manitoba"	2.40	2.74	1.85	Hoopvol ...	1.56	4.01	1.69
Queen Fan ...	2.65	4.82	1.14	Daeraad ...	1.83	4.8	1.25
Mean	2.87	3.70	2.67	Mean	1.9	4.55	3.37
S.E. Mean				S.E. Mean			
Yields ...	0.16	0.07	0.08	Yields ...	0.17	0.05	0.17
L.S.D. (5%)	0.50	0.24	0.24	L.S.D. (5%)	0.54	0.2	0.53
Coef. of var. %	11.3	3.86	5.8	Coef. of var. %	18.16	6.8	10.3
Var. ratio ...	7.69	59.7	57.00	Var. ratio ...	2.62	17.37	32.1
F. requirement	1.72	1.72	1.72	F. requirement	1.72	1.72	1.72

DISCUSSIONS With only three seasons results available means are not extracted.

SORGHUM

The annual sorghum variety trial, which failed in 1954/55 and 1955/56 was planted on two sites in 1956/57 in an attempt to ensure a

result. Both trials failed, the one being destroyed by a late frost and the second as a result of poor germination.

BEANS AND COWPEAS

The bean and cowpea variety trials were destroyed by hail. In the cowpea trial New Era was the only variety of the 16 tested to recover and produce some grain.

OTHERS

Observation plots of a range of varieties of sunflower, groundnuts, and soyabean varieties were established at Maseru. The crops were hail damaged and yields are not presented.

14 SUMMARY AND COMMENTS

The deficiency of phosphate in lowland and foothill soils continues to dominate the soil fertility status picture. The Department is now in a position to make categorical recommendations in respect of phosphatic fertilizer use. As a result of extension work and propaganda the demand for phosphates has grown considerably. Thus in September of this year alone 120 tons of superphosphates were disposed of through the Experiment Station Advances Account compared with 110 tons sold departmentally during 1956. Commerce is taking an increasing interest in fertilizers.

The general use of phosphatic fertilizers will at least double grain production in Basutoland.

The role of nitrogenous fertilizers is emerging. In maize response to N is closely related to plant population, 15,000 plants per acre being the optimum stand for dressings of 40 to 60 lb. per acre. Side dressings of this order on dense stands produce economic returns. Sorghum yields are generally not improved by nitrogenous fertilizers while for winter wheat their effect is dependant largely on spring rainfall conditions.

The potash content of all Basutoland soils is at present adequate for cereals and legumes.

Lime has been shown to consistently produce appreciable yield increases in cereals and legumes on acid soils derived from basic igneous rocks and in legumes on the light sandy loams formed from sedimentary formations. In the latter the base status is low and the level of certain nutrients marginal in terms of crop requirements. Zinc deficiency, and another, presumed to be one of iron, were invariably induced in the first crop following an application of a ton or more per acre of lime to the grey-brown sandy loams.

It is possible that the large responses to lime on the foothill red loams is due in part to the rendering available of a micronutrient. The responses by maize to manganese (in a form no doubt containing impurities) and to the borax-molybdenum mixture on this soil are most interesting. Present season (1957/58) pot and

field trials have thrown light on the question and there is evidence of a widespread molybdenum deficiency.

After one more season the Department should be in a position to make sound recommendations in respect of maize, bean and wheat varieties for the lowlands and to start the multiplication of proved selections of sorghum and wheat for the high country.

Until analytical data on Basutoland soils are available there must continue to be a measure of conjecture about the relationships between the results from various experiments and in their interpretation.

15 PRESENT SEASON PROJECTS (1957/58)

With the exception of the sorghum NPK trials the field investigations reported on here are being continued. In Basutoland the following new trials have been laid out:—

- (1) Twelve small minor element experiments on farmers' holdings in the foothills.
- (2) Three minor element experiments at the Machache Station and one at Leribe.
- (3) A grass ley investigation.
- (4) A tillage experiment of improved design.
- (5) Two variety trials in the mountains.
- (6) Five trials with varying rates of N, rates of P and Maize espacements.

A greenhouse has been erected and a start made on a scheme for pot investigations using subtractive techniques. The approach is proving of value.

ACKNOWLEDGEMENTS

The helpful advice of Messrs. E.R. Muller of Natal University and M. Westcott of Rothamsted is acknowledged.

The efforts of the Junior Service Assistants, Messrs. E. Matsela, S. Moliboea and B. Masia, who, under Mr. M Thatho, B.Sc. have worked so well, must be placed on record.

A.C. VENN.
Soil Fertility Officer.

APPENDIX I MEAN MONTHLY RAINFALL (Nine stations, at District Headquarters)

					Average for 7 years	Deviation	
1956	September	...	...	0.72 inches	0.71	+0.01	
	October	...	...	2.05 "	2.54	—0.49	
	November	...	...	4.18 "	3.31	+0.87	
	December	...	...	7.51 "	4.07	+3.44	
					Average for 8 years	Deviation	
1957	January	...	...	5.13 "	4.49	+0.64	
	February	...	...	4.07 "	5.87	—1.8	
	March	...	...	3.89 "	3.62	+0.27	
	April...	...	...	2.11 "	2.3	—0.19	
	May ...	...	...	0.4 "	1.08	—0.68	
	June ...	...	...	0.58 "	0.40	+0.18	
	July ...	...	...	0.88 "	0.41	+0.47	
	August ...	...	...	2.45 "	0.36	+2.09	
	September	...	...	5.75 "	0.9	+4.85	
	October ...		...	6.58 "	2.5	+4.08	
	November	...	...	4.03 "	3.39	+0.64	
	December	...	...	3.8 "	4.6	—0.8	
Yearly Total					39.67 "	29.92	+9.75

Annual Average for 41 years: 29.21 inches.

APPENDIX II

STAFF

In the list which follows are given dispositions of staff as at 31st December, 1957.

MASERU.

P.A. Bowmaker, O.B.E.... Director of Livestock and Agricultural Services
D.D. Campbell, M.C. ... Principal Agricultural Officer.
P.H. Brown ... Principal Veterinary Officer.
S.H. Youthed ... Soil Conservation Officer.
J.G.S. Bennie ... Wool and Mohair Officer.
N.N. Ralitapole ... Veterinary Officer.

A.C. Venn,	Soil Fertility Officer.
J.R.L. Kotsokoane	Agricultural Education Officer.
P.W.A. Davies	Agricultural Officer.
A.G. Brightmore	Senior Agricultural and Livestock Officer
J.J. Axentowicz	Agricultural and Livestock Officer.
G. Nchee	Forestry Officer.
R.F. Phillips	Accounting Clerk.
Miss H.B. Corney	Senior Lady Clerk.
F. Makhooane	Clerk/Storekeeper.
Mrs. C.E. Carton	Lady Clerk/Typiste.
E.T.G. Ntsasa... ..	Assistant Agricultural and Livestock Officer.
E. Lesoli	Assistant Agricultural and Livestock Officer.
N.J. Molapo	Administrative Assistant.
T. Motsamai	Senior Veterinary Assistant.
C.A. Motsamai	Teacher-Boarding Master.
L.A. Makoa	Teacher.
	1 Senior Conservation Foreman.
	2 Soil Conservation Foremen.
	10 Demonstrators.
	3 Veterinary Assistants.
	12 Assistant Demonstrators.
	8 Clerks.

MAFETENG.

E.J.V. Wiggill	Agricultural and Livestock Officer.
	1 Soil Conservation Foreman.
	1 Veterinary Assistant.
	3 Demonstrators.
	4 Assistant Demonstrators.
	1 Clerk.

MOHALE'S HOEK.

A. Bisschoff	Senior Agricultural and Livestock Officer
M.C. Macintosh	Assistant Soil Conservation Officer.
	1 Veterinary Assistant.
	5 Demonstrators.
	6 Assistant Demonstrators.
	1 Clerk.

QUTHING.

H.B. Wroughton	Agricultural and Livestock Officer.
	1 Veterinary Assistant.
	4 Demonstrators.
	6 Assistant Demonstrators.
	1 Clerk.

QACHA'S NEK.

V.S. Gilbey	Agricultural and Livestock Officer.
	1 Veterinary Assistant.
	7 Demonstrators.
	4 Assistant Demonstrators.
	1 Clerk.

MOKHOTLONG.

C.M.K. Seape Development Officer (Acting Agricultural and Livestock Officer).
1 Veterinary Assistant.
7 Demonstrators.
5 Assistant Demonstrators.
1 Clerk.

BUTHA BUTHE, LERIBE AND BERE.

I.L. Chard Senior Agricultural and Livestock Officer
D. Schneider Assistant Soil Conservation Officer

BUTHA BUTHE.

A. Mathule Assistant Agricultural and Livestock Officer. (Acting Agricultural and Livestock Officer).
1 Veterinary Assistant.
3 Demonstrators.
4 Assistant Demonstrators.
1 Clerk.

LERIBE.

S. Letsie, B.E.M. Development Officer (Acting Agricultural and Livestock Officer).
2 Soil Conservation Foremen.
1 Veterinary Assistant.
6 Demonstrators.
4 Assistant Demonstrators.
1 Clerk.

BERE.

D. Lekena, B.E.M. Development Officer (Acting Agricultural and Livestock Officer).
1 Veterinary Assistant.
1 Soil Conservation Foreman.
3 Demonstrators.
4 Assistant Demonstrators.
1 Clerk.

PILOT PROJECT

D.H. Taylor Administrative Officer (seconded)
P. Millin Agricultural and Livestock Officer (seconded.)
A. Wuister Mechanic-Supervisor.
G. Mochochoko Development Officer (seconded).
1 Soil Conservation Foreman (seconded)
1 Co-operative Organiser.
4 Demonstrators (seconded).
1 Clerk (seconded).
1 Clerk-Recorder.

MECHANISED GROUP FARMING.

A.H. Gibson	...	...	...	Agricultural and Livestock Officer (seconded).
P. Tsoeu	...	...	...	Assistant Agricultural and Livestock Officer (seconded).

Vacancies on Establishment.

- 6 Demonstrators.
- 4 Assistant Demonstrators

APPENDIX III

IMPORTATION OF MAIZE FROM THE UNION OF SOUTH AFRICA.

(Bags of 200 lb. Nett)

				1956	1957	9 year average
January	...	...	...	25,608	14,687	16,244
February	...	...	...	29,815	7,173	13,917
March	...	...	...	24,285	18,732	11,779
April...	...	...	...	12,411	9,888	8,925
May ...	...	...	...	9,961	3,854	7,996
June ...	...	...	...	6,933	4,345	5,580
July ...	...	...	...	1,521	3,842	4,918
August	...	...	...	3,895	3,966	10,357
September	...	...	...	1,593	2,933	10,292
October	...	...	...	4,137	4,600	15,527
November	...	...	...	4,581	7,202	18,758
December	...	...	...	7,744	9,738	18,068
Total...	...	...	...	<u>132,484</u>	<u>90,960</u>	<u>142,361</u>

APPENDIX IV.

DISTRICT DEMONSTRATION PLOTS RESULTS 1956/57. (Yield in 200 lb. bags per acre)

District	Treatment	Maize		Sorghum		Beans		Peas		Wheat		Barley		Regional Av.	
		No. of plots	Acres Av. yld/acre	No. of plots	Acres Av. yld/acre	No. of plots	Acres Av. yld/acre	No. of plots	Acres Av. yld/acre	No. of plots	Acres Av. yld/acre	No. of plots	Acres Av. yld/acre	No. of plots	Acres Av. yld/acre
Butha Buthe	Manured Control	11	22.0	7	15	...	...	...	...	...	...	...	...	18	37.0
		11	25.5	7	14	...	...	...	...	...	...	...	...	18	39.5
Leribe	Manured Control	...	...	8	20	...	...	1	2	3	6.5	...	...	12	28.5
		...	...	9	20	...	...	1	2	1	2.0	...	...	11	24.0
Berea	Manured Control	20	54.0	...	...	...	...	...	...	...	...	...	...	20	54.0
		29	87.0	...	...	...	...	...	...	6	10	...	...	35	97.0
Mohale's Hoek	Manured Control	16	78.9	8	23.9	...	...	...	...	4	10.8	...	...	28	113.6
		7	20.1	2	6.1	...	...	...	...	...	...	...	...	9	26.2
Quthing	Manured Control	29	98	80	80	1	5	...	...	...	...	1	4	111	187
		29	98	80	80	1	5	...	...	...	...	1	4	111	187
Territorial Average	Manured Control	76	252.9	103	138.9	1	5	1	2	7	17.3	1	4	189	420.1
		76	230.6	98	120.1	1	5	1	2	7	12.0	1	4	184	373.7

Note: All averages are weighted by acreage values. (...) figures not available

APPENDIX V. Livestock Industry Statistics

		Cattle	Horses	Mules	Donkeys	Sheep	Goats	TOTALS
Census	1949	430,998	98,832	2,468	48,905	1,557,546	609,267	2,748,016
	1951	401,221	102,903	3,089	59,188	1,564,001	637,065	2,767,467
	1953	406,454	92,884	3,550	53,543	1,303,325	550,612	2,410,368
	1955	408,144	102,001	4,829	48,855	1,339,019	654,800	2,557,648
	1957	381,770	81,661	3,599	48,616	1,220,769	535,286	2,271,701
Tattooing and Registration of								
Stock (1957)	...	63,732	20,393	288	11,329	321,944	170,121	
Exports	...	11,515	33	1	2	3,112	44	
Imports	...	12,451	3,675	95	108	332	24	
Wool Exports (lb.)	...	—	—	—	—	6,681,544	—	
Mohair Exports (lb.)	...	—	—	—	—	—	1,033,552	
Bones Exported (lb.)	...	—	—	—	—	—	—	
Hides Exported (Units)	...	28,789	—	—	—	—	—	
Skins Exported (Units)	...	105,930	—	—	—	—	—	



Aerial Photograph, taken about 3,000 ft. above ground level, of lowland cultivation. Note the extent of erosion and the contour furrows constructed through the lands to combat this.

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